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Choosing White Bearing Metals

By Edmund R. Thews
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COMPREHENSIVE studies and experiments toward the improvement of white bearing metals have caused a rapid development of this group of metals in quality as well as in regard to the number of alloys for the various purposes. Apart from the common white bearing metals consisting essentially of lead, tin, antimony, and copper—the tin contents of which range from 5 per cent in the French and German railroad bearing metals to 85 per cent required for turbine bearings—lead-antimony-copper alloys, zinc bearing metals, and lead-alkaline earth alloys have been developed during and after the war.

The use of all kinds of substitute metals and alloys during the war period of rapid expansion was followed by a general tendency to return to the tried-out alloys formerly used, a change which did not in all cases mean an improvement of the technical properties of the bearings. It is a matter of fact that the best white bearing metals are not produced from absolutely pure metals alone, but by using a certain quantity of bearing metal scrap and "tin alloy," as long as the scrap employed is free from aluminum and zinc and from large quantities of the other so-called deteriorating constituents of bearing metals. Before discussing the various points involved it will be necessary to recount the most important technological properties of white bearing metals which are not employed merely to reduce friction and to maintain cool bearings, but for economical reasons, since it is much cheaper to line the brass or steel bushings with soft white metals than to have the shaft rotate in brass or steel bearings which after a time will necessitate complete replacement of the worn parts.

> The great number of combinations possible in white bearing-metal alloys makes it desirable for the designer and the shop man to have a clear understanding of the effects of each element entering into the alloy on the final bearing qualities of the metal to be selected for the bearing

In the first place the white bearing metal must be sufficiently soft to adapt itself to the shape and the movement of the rotating shaft, and to take up and distribute the pressure uniformly. For this reason, the alloy used must be rich in tin or lead, and correspondingly poor in antimony and copper, depending upon the conditions.

In order to attain a favorable coefficient of friction and a high degree of resistance, the metal must also be sufficiently hard, a condition which accounts for the greater suitability of white bearing metals rich in tin, since these are considerably harder than bearing metals rich in lead.

White bearing metals must be tenacious in order to withstand the pressure and the shocks involved. The higher the content of tin, and the lower the percentage of antimony contained above a certain minimum content, the more pronounced the tenacity of the alloys. Very small amounts of arsenic suffice to lower the tenacity and the wearing properties of white bearing metals.

The conductivity of heat of the bearing alloys must be high, without, however, endangering the bushings. The higher the specific heat and the lower the atomic weight of the bearing metal alloys, the cooler the bearings. These requirements also point to the suitability of alloys rich in tin. The alloys must possess as low a melting point as is compatible with the conditions involved, and must not segregate in the liquid state. On melting the bearing metal alloy, it should not form ashes or dross, and must give sharp and homogeneous castings free from blow holes. Small amounts of phosphorus and arsenic increase the sharpness, homogeneity, and fineness of grain, and decrease the porosity of the castings. Finally, bearing metal alloys must be resistent against the corrosive influence of oil and dirt in the cold and hot state. It is a characteristic property of high-grade bearing metals to contain hard grains uniformly distributed in a soft and tenacious ground mass, a principle carried further in some German bearing metals which contain quantities of limestone imbedded in white metals poor in tin. The porous limestone absorbs lubricating oil and is rapidly polished.

The question of adding graphite to white bearing metal alloys has never been dropped, and there are a number of manufacturers and users who consider such

an addition as being beneficial to the wearing and sliding properties of bearing metals. The addition of aluminum or silver to bearing alloys is of questionable value, however, and these elements must be regarded as strictly deteriorating components of white bearing alloys.

In making up the modern white bearing metal alloys depending for their hardness on the presence of antimony, sufficient antimony must thus be added to the lead-tin alloy to form the hard tin-antimony crystals required, while some of the antimony added is taken up by the lead-tin ground mass. On account of the comparatively low specific weight of the hard tin-antimony crystals these tend to segregate, but this tendency is counteracted by the addition of a corresponding amount of copper. With commencing solidification of the bearing metal, copper-tin alloys crystallize out in a netted form distributed uniformly throughout the entire mass which prevents the tin-antimony crystals from rising to the top.

An excess of copper is also beneficial in increasing the hardness without lowering the tenacity of the alloy, since the ground mass as well as the tin-antimony crystals take up some copper. However, as the amount of copper present rises the pouring temperature of the bearing metals increases rapidly and the structure becomes more granular. The higher the tin content of the alloys, the lower must be the percentage of copper contained in order to prevent too strong a tendency of the bearing metal to crack if exposed to the action of high velocities of the shaft.

Lead Is Beneficial

Alloys containing 80 per cent of tin or higher must not contain a high percentage of lead, which in no case should exceed 1 per cent. Small amounts of lead are beneficial, however, in increasing the fluidity of the alloys while pouring, and in improving the elongation and the resistance against fluctuations of load. Nickel in the alloys should only be permitted in the presence of a high content of tin and in the absence of lead. Small percentages of arsenic increase the fluidity and decrease the porosity of the alloys, besides giving sharper castings. However, these advantages are accompanied by a marked decrease of hardness and tenacity. Alloys containing from 0.8 to 1.4 per cent of arsenic are frequently recommended, practical experiments having shown that such alloys are appreciably harder at higher temperatures. The influence of arsenic toward the formation of a very fine grained structure and a higher degree of fluidity is equally pronounced in alloys rich in lead as well as in tin. Another decided advantage of the presence of small percentages of arsenic in white metal alloys is the protection afforded against oxidation. Zinc, however, must not be present in ordinary white bearing metals.

Within certain limits the quality and durability of white bearing metals is not dependent upon exact compositions as much as on the methods of melting and pouring of the alloys; and on the treatment of the bearings in service. The hardness, for instance, is strongly influenced by the cooling of the metal after pouring, the hardness obtained by rapidly cooling often amounting to twice the degree of hardness reached by permitting the alloys to cool slowly. The same is true of the strength of the alloys, which is also increased considerably by rapid cooling.

The pouring temperature also influences the mechanical properties of the bearing metal. In America, bearing metal alloys are usually poured at somewhat lower temperatures than customary in Europe, varying between 850 and 900 deg. F. On the Continent, these temperatures are only maintained for alloys very rich in tin, while all bearing metals containing less than 70 to 75 per cent of tin are usually poured at about 950 to 1,000 deg. F. There can be no doubt that the latter temperature is too high for most alloys, however, and a temperature of 930 to 950 deg. F. may be considered the most suitable temperature that will give a high degree of fluidity and sharp castings.

Pouring the metal at too low a temperature gives rise to the formation of coarsely granular structures while excessively high temperatures increase the softness of the alloys without correspondingly improving the tenacity. Best results are obtained if previous to pouring the boxes are heated to a temperature of 300 to 400 deg. F., which will cause a more uniform contraction and a more perfect adhesion of the white metal. The uniformity and density of the bearing metal also is favorably influenced by this treatment.

These deductions are based upon many years of practical experience, and indicate that the mechanical properties of bearing metals may be greatly improved by efficient casting and treatment, and that, on the other hand, a considerable percentage of all bearing metal troubles are exclusively due to ignorance and carelessness in this respect.

Low grade bearing metals, on the other hand, containing very little tin, are apt to stick to the shafts, so that for very exacting service bearing metals must be high in tin. For high speeds of revolution such as in turbines, and heavy loads, where a high degree of hardness and tenacity is necessary, alloys containing from 75 to 85 per cent tin, 10 to 15 per cent antimony, 5 per cent copper, and small amounts of lead are required, while for high speeds of revolution but ordinary loads, alloys containing 50 per cent tin, 15 per cent antimony, and 35 per cent lead give satisfactory service. The accompanying table gives the composition of a number of bearing alloys rich in lead frequently used.

Tin	Antimony	Lead	Copper	Arsenic	
....	16	84	....	....	.....
2	18	80	....	....	.....
5	15	80	....	....	.....
5	14	80.25	....	0.75	(Fine grained)
6	7	87	....	....	Heavy loads
10	15	75	....	....	American railroads
10	10	80	....	....	Magnolia
10	20	70	....	....	French bearing
14	14	71	0.50	0.50	.....
11.4	7.53	80.65	0.42	....	Soft bearing metal
11.5	13.50	72	3.00	....	Locomotive bearings
18	10	71.75	0.25	....	.....
20	20	60	....	....	Railroad bearings
20	7.5	72.50	....	....	.....
20	17	63	....	....	.....
21	7	72	....	....	Heavy naval machines
24	13	61.50	1.50	....	.....

Practice has almost invariably shown that bearing metals of medium and low tin content give best results if made from tin alloy, and that good service is being rendered by all grades of bearing metals containing from 20 to 30 per cent of old bearing-metal scrap. In using scrap, however, it is necessary to know the exact composition of the alloy used. As a rule, only zinc is present as deteriorating constituent, and this may easily be removed by melting the scrap in iron pots and poling with steam or a thin pole of fresh wood until the characteristic zinc-skin appearing on a fresh surface of the fused metal ceases to be produced immediately.

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The Air-Cooled Radial "Wasp"

By Ellsworth Sheldon
New England Editor, American Machinist

How the "articulated" connecting rod is made

CONCENTRATION of power in small compass without sacrifice of reliability is, next to reduction of weight per unit of energy, the greatest desideratum in the design of airplane engines. How to connect the maximum number of pistons to one crankshaft in a minimum space is a problem that seems to be reduced nearly to its ultimate analysis in the radial type of engine, of which the "Wasp" is an example.

The nine pistons of this engine are connected not mereley to one crankshaft but to a single crank by means of one master-rod and eight subsidiary rods, or "links," called, collectively, the "articulated rods." The several members of this system of connecting rods are drop forged from steel and are machined and polished all over, presenting not only the pleasing appearance of an exceptionally fine piece of mechanism, but one in which the symmetry and balance is preserved with meticulous care.

Upon the master-rod alone there are forty operations. The forging from which it is made—to be seen at the left in Fig. 46—weighs approximately 42 lb., this weight being reduced to about 9 lb. in the finished rod to be seen at the right in the same illustration. The remaining sample in this picture shows the rod at a mid-stage of its progress and explains how some of the transformations are brought about. The operations upon the smaller, or "link" rods are much less complex, but many of them involve the use of similar tools and fixtures and follow the same general line of progress. Disregarding the preliminary operations of milling off the flash, inspecting for possible defects, etc., we come at once to the first major machining operation, which is performed as shown in Fig. 47 in a Bullard vertical turret lathe of 36-in. capacity. Here the forging is trued up in a chuck having special jaws to which clamps have been added to provide greater security, and the hole for the crankpin is drilled from the solid metal, bored true with a boring bar, and reamed. While still in the chuck an annular groove is made in the bore, the purpose of which will appear later.

At the same setting the flange and the end of the hub are faced, leaving a large radius at the junction. The rod here to be seen standing upon the table of the machine represents its condition at the completion of this stage. When this job has been completed upon a given lot of rods, a fixture having at its center a stud to fit the newly finished bore, is substituted for the chuck jaws upon the table of this or another machine of the same kind, and the facing operations are repeated upon the opposite flange and end of hub.

The rod then goes to a Lincoln-type milling machine in which it is held by a fixture, the main feature of which is a stud projecting horizontally from the upright face of an angle-plate base. The rod is wrung upon this stud and clamped to the fixture in such position as to allow a pair of straddle mills to remove the extra stock from both sides of the boss at the small, or wristpin, end. Following this operation the hole is drilled and reamed in the smaller boss, the fixture again locating the rod from the main bore. These two holes become the locating points in a series of operations, not shown here, that are performed on single-spindle and two-spindle drilling machines with drills, end mills, boring heads and similar tools, making the cuts shown at *A*, *B* and *C* in Fig. 46 as starting points

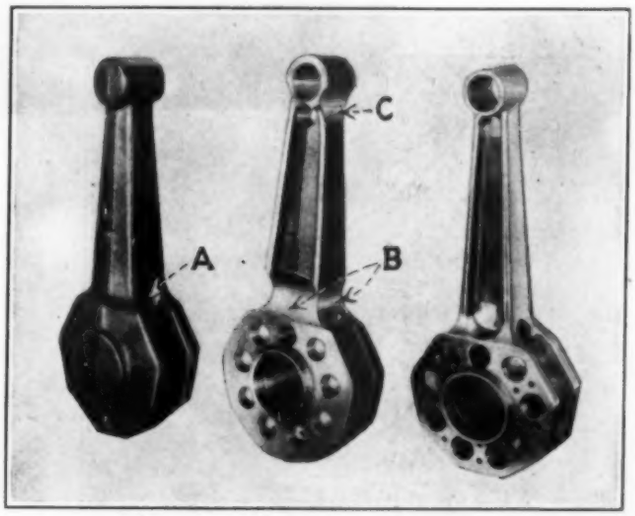

Fig. 46—Master connecting rods. The rod at the left is in the drop-forged state. The rod in the center is in the mid-stage of completion, while the one at the right is fully completed. The forging weighs 42 lb. and the finished rod weighs 9 lb. Forty operations are required to complete the rod

The ninth article. The tenth will appear in an early issue.

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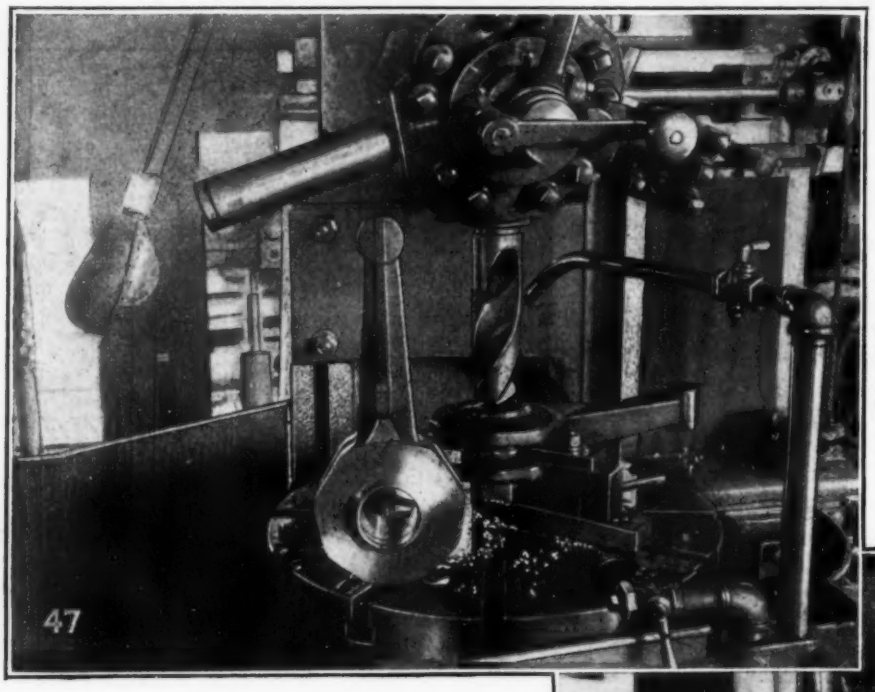
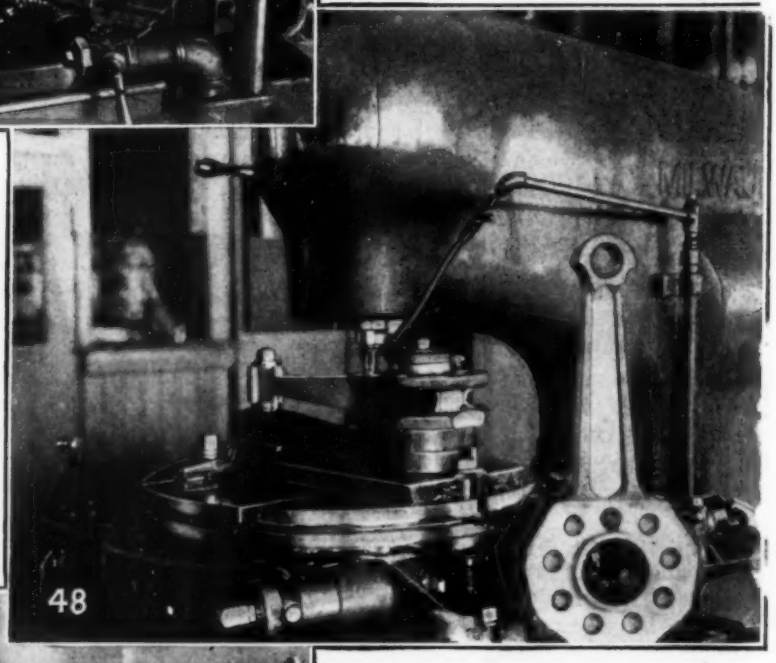


Fig. 47—The first major machining operation. The forging is held in a chuck equipped with special jaws. The hole for the crankpin is drilled from the solid, bored true with a boring bar and then reamed. At the same setting the flange and the end of the hub are faced

Fig. 48—Fixture and set-up for the channeling operation. The web of the rod is channeled on both sides by an end mill. Location and support are by studs that enter the holes at the ends. A channeled rod can be seen standing on the machine table



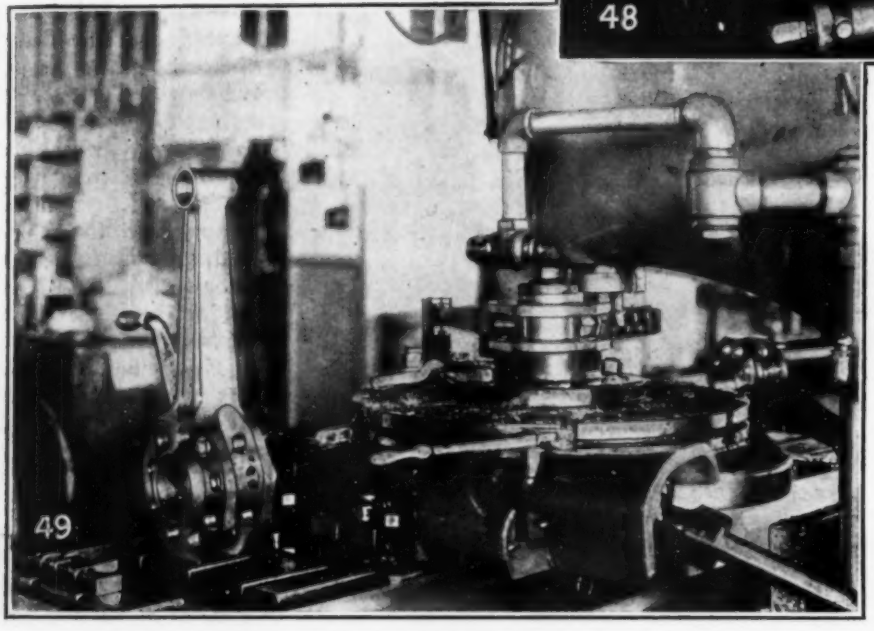


Fig. 49—An annular channel is milled around the flange at the large end of the rod by an interlocking cutter, by which the width of the channel can be kept within close limits. The fixture and set-up are similar to those used in the preceding operation

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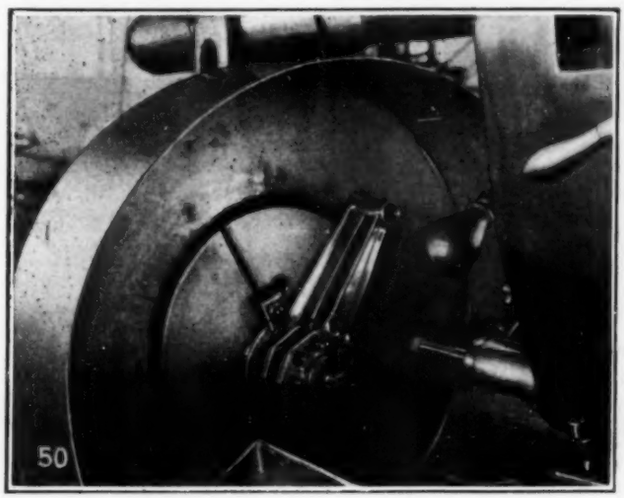


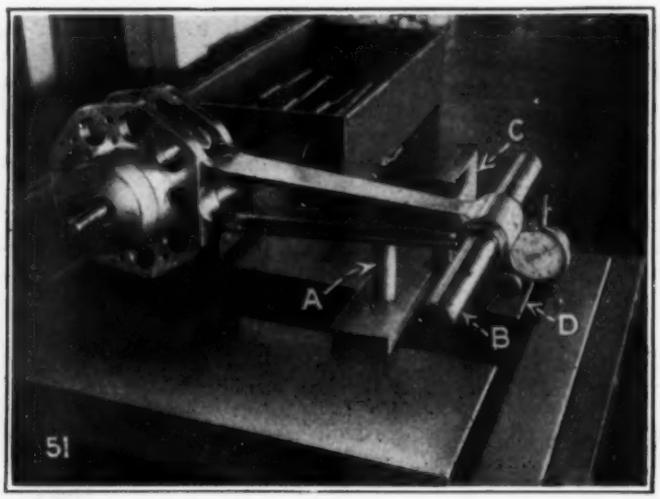
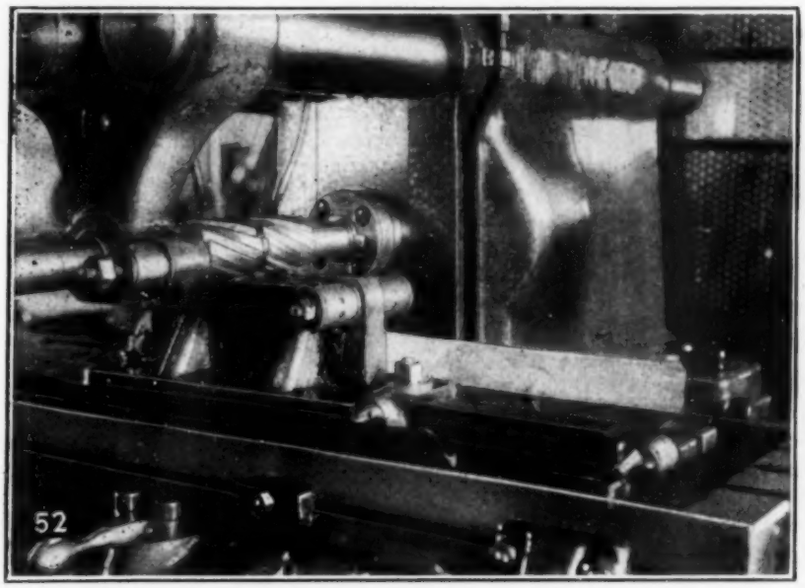


Fig. 50—The holes in the rod—including the eight holes for the links that go to make up the "articulated" rod—are ground. The fixture for holding the rod is so mounted as to be indexed from one to the other of the eight smaller holes. Another fixture is used for grinding the main holes. Fig. 51—The rod goes through many tests in its progress. One of the final tests is shown in this picture. Here the stud on which the large end is held is parallel with the baseplate. The dial indicator is used to check the squareness of the wristpin hole in both directions

for the milling operations to follow. In all these operations the tools are guided by bushings, in some cases below as well as above the cut, in special fixtures that have been designed for this purpose, for in all of them the dimensions and relative positions are as zealously preserved as though they were finished cuts instead of merely the starting points of others.

The next major operation upon the master-rod is performed with the rod held in a jig. This jig is of box construction, with a stud rising from the bottom of the interior over which the bore of the rod fits tightly. A smaller stud in an outlying flange of the base enters the hole in the smaller boss to locate the rod circumferentially. The work-piece is confined in the jig by a hinged cover, or leaf, in which there are eight bushings arranged in a circle about the center, corresponding with the eight blind holes to be seen in the flange of the middle one of the row of rods in Fig. 46. In the bottom of the jig, opposite to the above-mentioned bushings, are eight other bushings to guide the tools used to drill the corresponding holes in the opposite flange. The jig is reversible, and the sixteen holes are reached by merely turning it over on the table of the drill press. The ninth hole to be seen in this circle is a clearance



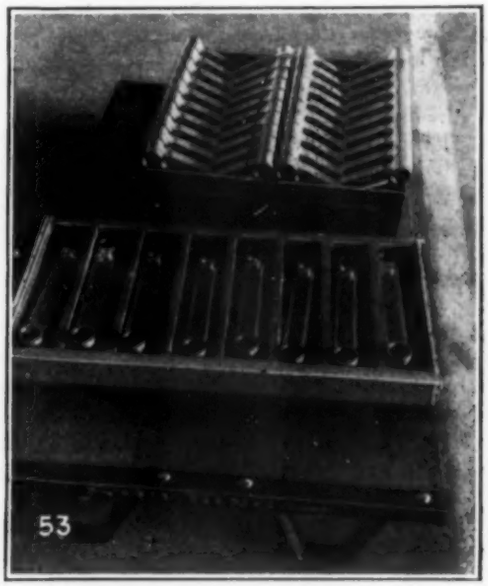


Fig. 52—A milling operation on one of the "link" rods. While these rods do not go through as many operations as do the master rod, they are machined with the same care. The holes are ground and the webs are channelled. Fig. 53—Extreme care must be used to prevent damage to the rods as they pass from one operation to another when near the completed stage. This picture shows one of the compartment trays in which they are kept and transported. The rods in the metal pans at the rear are far from completion

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hole, drilled in a preceding operation to lighten and balance the rod.

The reason these holes, which are to become through holes, are not drilled clear through at this stage, is that they would break partly into the space between the flanges, and no drill could go through, half in and half out of the particularly tough steel of which these rods are made. In a later operation the channel between the flanges is milled to a depth considerably in excess of that necessary to clear the holes, which thus become single straight holes passing through both flanges. In this drilling operation it is necessary for the drills to go deep enough only to overlap the path of the milling cutter.

Next comes a series of milling operations to finish the tapered and flat sides of the web. It is for the start and finish of the cuts here taken that the stock was removed at *A* and *B*, Fig. 46, by drilling and boring; the surfaces then produced in the fixtures establishing the guides for these later cuts. Simple fixtures on which the rod is located and supported by studs that enter the two principal holes are provided. The web of the rod is channeled on both sides by an end mill. The fixture and set-up may be seen in Fig. 48 on the rotary table of a Milwaukee milling machine of the vertical type.

The appearance of the rod after the above-mentioned milling operations have been performed, is indicated by the rod standing on the table of the machine in this illustration. These is still another milling cut to be made around the periphery of the small boss, for which the fixture here shown is moved to bring the smaller stud central with the rotary table.

Milling End of Rod

A similar fixture and set-up is employed for the operation of milling the channel between the flanges at the large end of the rod. This job, shown in Fig. 49, is done with a double interlocking cutter by which the width of the channel is preserved within close limits. The rod after this operation is also shown on the table of the machine.

All holes in the rod are finished by grinding. The fixture used to locate the smaller holes in the circle about the main bore is shown in Fig. 50, clamped to the faceplate of a Bryant grinding machine. Studs in the base of the fixture corresponding with the main and wristpin bores in the rod, and the rod is set over them and held by means of a capscrew screwed into the end of the large stud. It is not taken off the fixture until all of the eight holes have been ground.

In the base of this fixture there are eight bushed holes in a circle around the large stud in the same relation to it as are the eight holes in the rod to the main bore. Fixed in the spindle of the grinding machine is a true plug which is a close fit for these bushed holes. To locate the work to grind any one of the circle of holes it is therefore necessary only to fit the corresponding bushed hole in the fixture over this plug and clamp the base to the faceplate.

The rods are drawfiled by hand and polished with abrasive cloth. Some parts are polished and buffed on wheels. Oil holes are drilled to communicate with all bearing surfaces. From each of the eight holes in the flanges a hole is drilled diagonally to communicate with the annular channel in the bore, made during the first drilling and boring operation. The wristpin hole is bushed with bronze. Two headed bushings of steel, lined with soft metal, are pressed into the main bore, to meet in the middle and form in effect a single bushing having heads on both ends. Oil holes in the wall of this bushing communicate with the annular channel above mentioned.

Tests for Alignment

Many tests are applied to the rod during its progress towards completion, one of the final ones being that shown in Fig. 51 to determine the alignment of the two principal bores. The stud upon which the larger bore is wrung is permanently a part of the fixture and is parallel in both planes with the baseplate. The pin *A* and the flat piece in which it is secured are loose on the baseplate, and serve merely to support the overhanging weight of the rod while the test is being applied. The hardened and ground steel bar *B* is wrung through the bore in the small end of the rod.

The part *C* is an accurately made right-angled block, having on one face a rib that, when the block is placed with the ribbed face down, bears against the ledge shown at *D* on the baseplate. This block is also loose and may be moved about at will of the inspector. The dial indicator is fixed on the block.

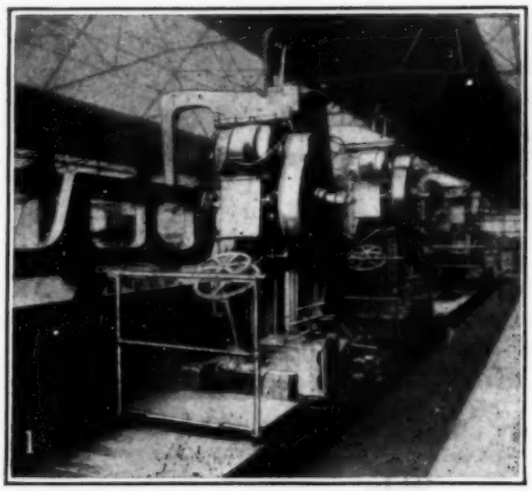
When used as here shown the spindle of the dial indicator is pushed under the bar *B*, first at one end and then at the other, and the reading of the indicator noted. If the holes are parallel in this plane the readings should, of course, be identical. Turning over the block and bringing the rib to bear against the ledge at *D*, the indicator is again applied alternately to the ends of the bar *B* and the condition of its parallelism in this plane is then noted.

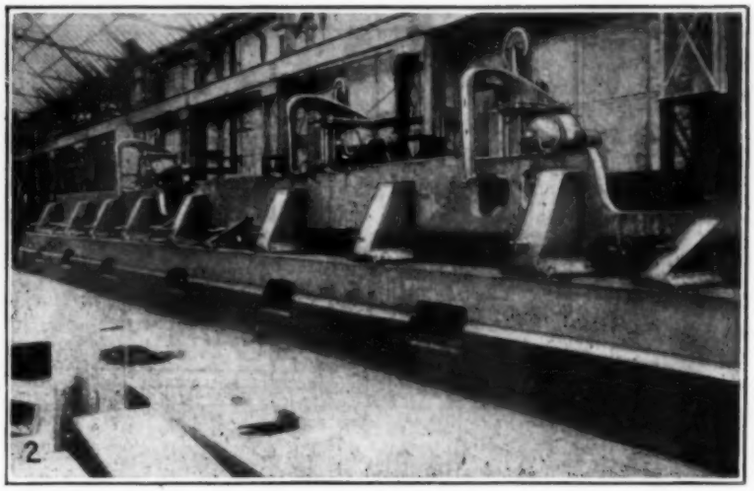
Though the operations upon the smaller, or link rods, are fewer in number than on the master-rod the same care is exercised in their making. Boring cuts, made in special fixtures, are the starting points and gaging surfaces from which the milling cutters take up the work of stock removal; the webs are channeled and the ends rounded in the same manner as in the master-rods. Equally painstaking is the filing and polishing and the grinding of the bores, both of which are bushed with bronze. Fig. 52 shows one of the milling operations in the series.

As an indication of the care taken in making these parts, Fig. 53 shows the compartment tray in which they are kept and transported around the shop as they near completion. The rods in the metal pans to be seen in the background are still far from the finished stage.

Erratum

In the reference book sheet published on page 669, the figure for maximum major diameter of ground machine screw taps for the 8-32 size should be 0.1670 instead of 1.670. The heading for the first line of figures for the major diameter of cut-thread taps should be "Min." instead of "Max." The shank diameter figure for the 2-56 size should be 0.141 instead of 0.151. These corrections should be noted on the reference book sheet.





Figs. 1 and 2 — Front and back views of machine for milling the openings in locomotive frames. Two or more complete milling machines travel on a long bed. The frame to be milled is held in special clamping fixtures and the cutter spindles are guided by rolls against templets. Two frames can be milled at the same time

Unusual Machine for Milling Locomotive Frames

By S. Weil
Frankfort A.M., Germany

Openings in frames are milled from the solid metal—Two frames can be milled at the same time—The feeds are automatic in all directions

VARIOUS methods have been tried for machining the openings in locomotive frames. The usual practice is to finish them by slotting, the openings being left in the rough in the forgings. Milling the openings from solid plates has been tried, and while more or less successful on light frames, such as are used in locomotives in some European countries, machines capable of milling heavy frames have not been available.

However, the Maschinefabrik Schiess-Defries A.G., Dusseldorf, has, in conjunction with the locomotive works of A. Borsig, Berlin-Tegel, brought out the special machine illustrated in Fig. 1 for this purpose. A rear view of the machine is shown in Fig. 2, while in Fig. 3 a diagrammatic elevation of the machine and its relation to the work, is given.

Essentially, the machine is composel of two or more milling machines mounted on a base having two guideways upon which they travel lengthwise. The milling heads, mounted on the columns, have vertical travel and are counterbalanced. The spindles are contained in sleeves and travel transversely. All the moving members are motor driven and are provided with means for traversing them in both directions, in slow movement for feeds and in rapid traverse for location. All movements can also be controlled by hand.

The openings in the frames are cut from the solid metal and all movements of the cutter are controlled by a roller working in a templet. The frames to be milled are held in special clamping heads in which they can be adjusted to any desired position. The clamping heads are attached to a stiff support that runs the entire length of the machine.

In operation, a starting hole for the cutter is drilled in the location of each opening. After the cutter has been inserted in the drilled hole, it is fed automatically in any one direction until its travel is arrested by adjustable stops. In changing direction of the cutter travel it is necessary, of course, to engage the proper feed by hand. The corners of the openings are rounded by combined vertical and horizontal movements of the cutter, manually operated, keeping the guide roller in contact with the templet.

The vertical and longitudinal feeds can both be engaged at the same itme and, by a combination of change gears, the cutter can be made to follow an angular path, the inclination of which is dependent upon the ratio of the gears in engagement. This angular movement is necessary in milling the wedge sides of the pedestal jaws.

When the machine is equipped for milling but one frame at a time, or two frames clamped together, it is

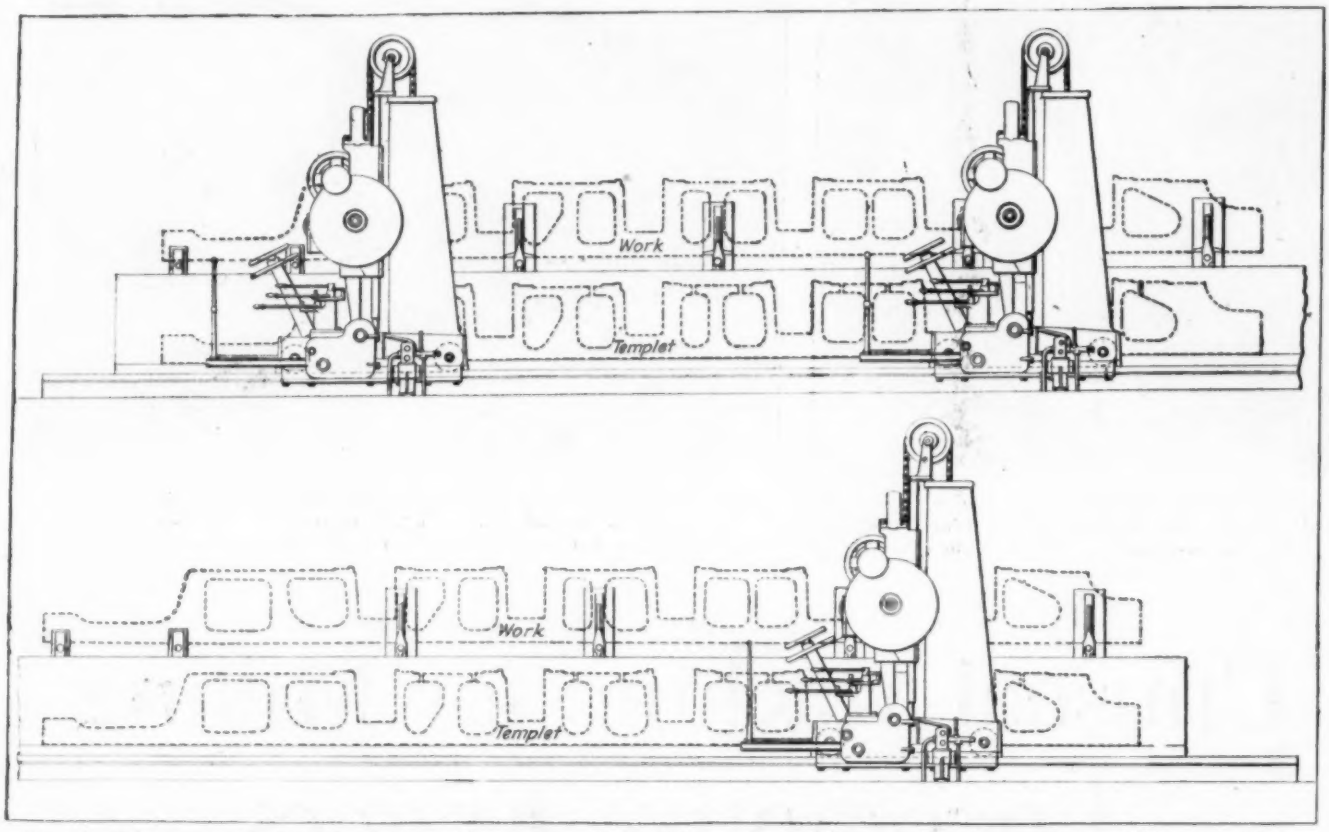


Fig. 3—Diagrammatic layout of the complete machine showing the relation of the milling machines to the work and templets. For milling two frames in tandem, three milling machines are in use. When equipped with three of the milling machines, the complete machine is 85 ft. in length and weighs 70 tons

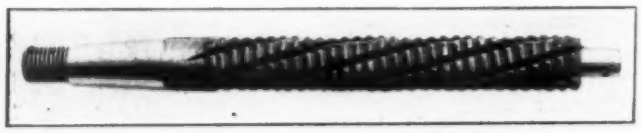


Fig. 4—One of the helical cutters for milling locomotive frames. It is rather unusual in design, in that rounded threads are cut upon the body

provided with two of the milling machines. When two frames in tandem are to be milled, as indicated in Fig. 3, three milling machines are provided. With two milling machines, the entire machine is 44 ft. long and with three machines it is 85 ft. long. In the latter case the weight is about 70 tons.

One of the helical cutters used is shown in Fig. 4, and is rather unusual in that it has rounded threads cut upon its body. It is held in the spindle by a draw-in rod and the outer end is ground to run in a bushing in the overarm.

Feeds of from $\frac{5}{8}$ to $1\frac{1}{2}$ in. per min. have been provided. The feed mechanism is contained in a gear box at the base of each milling machine and is driven by a gear meshing with a raw-hide pinion on the motor shaft. Each milling machine is provided with a platform for the operator to stand upon, from where he can easily reach all control levers.

Attaining the Simplest Design

By John F. Hardecker

THE design of any mechanism never attains its highest degree of perfection until it is simple in its construction and operation. True, many mechanisms involve so many functions that the combination must of necessity appear complex at first hand, but if it is a really good design, then the functions or operations can be broken down into a series of simple movements or parts. So it is an axiom of good design that to be the best attainable for a given purpose it must be simple. If it is not simple, it is quite likely that it will warrant further study to simplify it, and so make it a really good design.

A very effective way of keeping this truism always before the designer and draftsman is by the use of a series of blueprints or photographs, tracing the evolution of certain designs. These should be framed and placed on the walls of the drafting room. The first attempt at the design, whether it has been built or is only a study, with a clear statement of the problem or requirements, is number one in the series. Successive attempts, in blueprint form if merely studies, photographic if actually built, range alongside, until the last of the series closes the exhibit—this being a photograph of the part or parts actually in production.

Several sets of such exhibits will be amazing to those who carry out the undertaking, for it is remarkable how a design will simplify itself after the first complicated undertaking. The exhibit can be made even more instructive if costs are included—actual where the parts have been built, estimated where it is merely a design study. The effect of such an exhibit on draftsmen engaged in design work is very gratifying—that which they regard as a platitude of the "try and do it" type, unfolds itself before their eyes as a fact. Thus they are bound to have a new conception of design based on simplicity that cannot but help reflect itself in their work.

When the Boss Quits

By Frank L. Eidmann
Associate Professor of Mechanical Engineering
Princeton University

The actual loss of the services of a good man is only a small part of the expense to which his company is put

NUMEROUS investigations have been conducted to determine the financial loss to industry which is caused by "labor turnover." It has been shown that the cost of losing a worker and hiring his successor reaches an average cost of $250 with some firms. Other firms calculate this average cost as low as $50 per replacement. Offhand these figures may seem unduly high to one who has not given the matter close attention, but if all the indirect losses which actually result from the replacement of an employee could be ascertained, segregated and given a dollar-and cents valuation, the above mentioned figures would probably be found conservative. Admittedly the annual cost of "labor turnover" is enormous, and any effort to reduce the turnover, if it meets with any degree of success, will pay for itself many fold. But, how about "executive turnover"? What is the annual cost to industry due to the changing of executives? Figures relating to executive turnover are far more difficult to obtain than figures and statistics on labor turnover. Likewise is it almost impossible to estimate the indirect results incident to a change of executives; but when one stops to consider some of the losses that are directly traceable to a change in executives, the question arises whether the total losses due to "executive turnover" may not approach the total cost of labor turnover, and whether the searchlight of investigation and publicity should not be directed on it. Not so many years ago, when industrial waste and inefficiency was mentioned we at once thought of these wastes as attributable to the employee, but more recently it has been shown that the waste and inefficiency traceable to management exceeds that which may be charged to labor. It is quite possible that investigation will show that the costs chargeable to the replacement of executives may greatly exceed those chargeable to labor turnover.

When the dissatisfied executive has about made up his mind to quit he is going to lose his enthusiasm, and this will reflect itself in lowered efficiency throughout his organization. Another important factor is the change of minor executives that accompanies the move. In the new job there is much loss and confusion caused by making changes from the routine formerly in vogue

It is asked, "What are some of the losses that may result from a change of executives?" There are many. First of all, when the dissatisfied executive has about made up his mind to quit and to seek a new position he is in most cases going to lose some of his enthusiasm and interest in his work, and this will naturally reflect itself in the form of lowered efficiency throughout the organization under him—especially if it becomes generally known that the boss intends to quit. The effect on plan morale may be still greater if it is a case of the executive being discharged.

The expenses incident to the selection of a successor are usually high, especially if he come from outside the organization; and sometimes there may be a period during which the position remains vacant, resulting in countless losses from confusion and incorrect decisions that may be made by the temporary substitutes in the position. Another important factor is often the labor-turnover and the change of minor executives that accompanies the change of the higher executives. For instance, a manager who leaves may take with him to his new position several important executives. Each of these men in turn will take along minor executives and workers, thus greatly multiplying the "turnover" costs. I have in mind an instance where the general manager of a comparatively small plant left in order to join a competitor. He took with him his assistant, as well as the superintendent, the chief designer, several draftsmen, and some of the shop men. Not much imagination is required to picture the disadvantage to which the first firm was put, but, at the same time, the workers and the minor executives in the second plant were not in a high state of morale when the numerous changes were made in their ranks. For a time no one was certain of his job and naturally could not do his best work.

When the new manager and his staff arrive the great expenses that result indirectly from the change only begin. Usually the new manager has some pet ideas about production control or methods of wage payment. Of course the new plan has to be adopted. This not only results in throwing out all existing printed forms

but necessitates, in a large organization, hundreds of dollars of expenditure for new forms; and there is much loss and confusion caused by making changes from former routine. If the new staff makes changes in the design of the product, as is often the case, the expenses may be very high.

I do not want to give the impression that I am opposed to changing executives or to making the changes in design, methods of manufacture, or in production control, for any or all of these changes may be to the great ultimate good of the firm. But I do want to emphasize the fact that heavy expenses may be involved as a result of changing executives; that the changes are not always necessary and could sometimes be avoided if their far-reaching results were more generally appreciated.

Changes among the executives of the automotive industry in this country are numerous. It is reported, for instance, that more than 30 per cent of the passenger car manufacturers have changed their chief sales executives during 1926. The number of changes in other executive positions has been high. In this industry, as in all others, sometimes a change of executives pays well, but often the change doesn't pay at all—with the result that another change has to be made. One very large corporation (not in the automotive field), whose executive turnover has been very high and whose dividends have been very low, has an upheaval about every third year, as regularly as can be, when the president, and all the chief executives are ousted and a new lot selected by the board of directors. Wouldn't it be interesting if the cost of "executive turnover" could be definitely determined?

Stores' Control of Raw Material

By J. E. Padgett

Assistant to General Superintendent, Spicer Manufacturing Corporation

THE problem of controlling raw material inventories depends largely on the kind of business a particular manufacturer happens to have. There are three general classes, in two of which the problem is relatively simple. The first is the maker of such basic materials as steel, in which instance raw material control consists only of maintaining proper reserves of iron ore, limestone, coke, ferro-manganese and other minor materials. These same few elements will make his whole range of product and need be controlled only in relation to prospective total tonnage. The second class is the maker of a product that consists of one or at most a very limited number of sizes and models. The third and largest class in point of numbers, and the one in which raw material control must be very carefully worked out, is the manufacturer who makes a multitude of different kinds of product in different models and sizes, each of which uses its own special raw materials, any of which may be made obsolete tomorrow and substituted by a totally new one because of a change in demand. I will discuss in detail the control of raw material inventory in such a business. Our company supplies 100 per cent of its product to a very large proportion of the automotive industry. We get reactions from a large majority of companies. At the same time, the principal part of our materials take from four to six weeks to process. Thus we are between those two conditions of ordering our raw materials four to six weeks in advance, and simultaneously keeping step with automobile production schedules, which in the past thirty days in individual companies have increased within 2 days' time 100 per cent, and in some cases within three or four days afterward have been cut down again 25 per cent. Under these conditions it takes some real work to keep up with inventory control.

Speculation in materials must be eliminated if inventories are to be controlled. Speculation is becoming "taboo" in this day of buying for consumption. It has been discovered in most lines of business that obsolescence of bargain inventories more than offsets the price differential. Furthermore, speculation usually takes place in a rising market and the excess on hand when the market falls has to be depreciated.

It is essential to have the organization as a whole trained to hold inventories down to a minimum in order to get the fastest turnover possible. The next step is the actual commitment of materials for manufacture and the determination of the inventories to be carried. The raw material commitments and inventories are interlocked, of course, with the general manufacturing program, and cannot be properly determined except as a part of the whole.

Our entire manufacturing program is based on a sales forecast, issued each month on the 25th, which shows the actual and estimated sales conditions for the following three months. This sales forecast shows the quantity of each size and type of product for each customer. It is sent to the control department. From this together with information obtained from the production manager and the superintendents of the plants, and with information on the present condition of the productive inventory, a manufacturing program is laid out for the coming month. In addition to this manufacturing program the raw material requirements are estimated for two months beyond the one covered by the above program. These requirements are not determined in detail by size and kind of raw material, but show the expected production of each type and size of product. This information is all brought together in a material release, which is issued just previous to the beginning of the month. This material release is approved by the general manager before it is issued. The program outlined in this release may be the same as the sales forecast, but more often it is above or below these figures, due to our policy of smoothing out the productive curve as much as possible by producing standard material in low production periods and using this surplus in high production periods. All productive labor is paid on the group basis and this steady production is a big asset in getting the best out of the groups.

A point I may not have emphasized is that, for proper results, some one person must be delegated to control the inventories. In many plants this is not done and the schedule department, stores department, superintendent, manager all think someone else is doing it except when the big boss orders a clean-up once a year or so. It must be someone's job with a definite goal set or it won't be done consistently and properly.

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Details of Jigs and Fixtures

Design of Stops

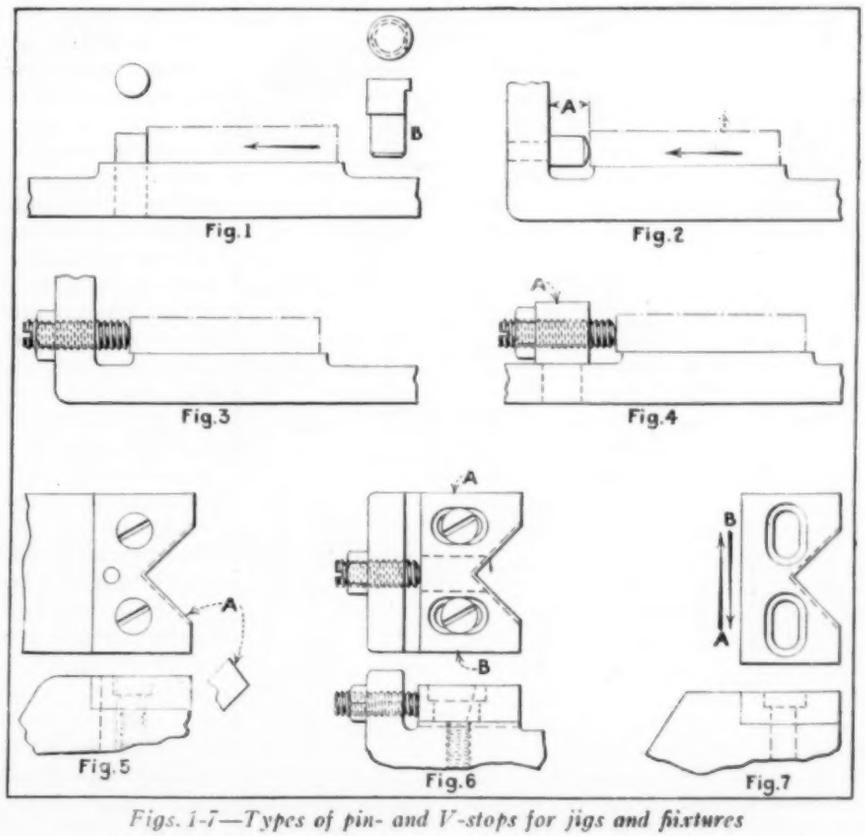
By J. A. POTTER

The stop is a highly important feature of jigs and fixtures, since upon it depends the accuracy of the finished work—Types and features of stops

STOPS on machine tools usually limit the length of stroke on the table or spindle of the machine, but in jig and fixture construction a stop is to be considered as a fixed point or surface against which the work rests. Stops can be used to support work, or to stop on the side, end, or top of the part which is to be machined.

A pin in a plate seat is a stop that can be used for light work. A sketch of such a stop is shown in Fig. 1. A variation of this stop, shown at *B*, can be used on a rough surface such as cast iron. A better stop construction is illustrated in Fig. 2, in which a shoulder pin, sometimes called a bunter, is driven into the wall of the jig or fixture. The particular advantage of this type is that any force, such as clamping, acts against the head of the bunter, putting it under compression, whereas in Fig. 1, the pin would be in shear, and is likely to be bent over or pushed out. The construction of the stop shown in Fig. 3 allows adjustments to be made for variation in castings, and is known as an adjustable stop. Some designers will not have an adjustable stop in any of their tools, taking the stand that machine operators can spoil work if the stop is not set correctly. In such cases, stops such as shown in Fig. 2 are used, and the distance *A* is fitted to the part. If the part should be a casting, at least three different castings should be used to get an average fitting. Sometimes a wall in the fixture would make it difficult to machine an internal surface such as a seat for locating blocks. In a case such as this, an adjustable stop can be used for driving in the "dutchman," shown at *A*, Fig. 4. This could also have a thread cut on the shank, and be held in place by a nut, which would keep it from being forced out by the clamping strain.

A vee is also one form of a stop, a sketch of which is shown in Fig. 5. This type is very useful for holding round pieces such as the end of a lever. Vees are often cut under on the locating edges as at *A*, in Fig. 5, to locate and hold down at the same time, a condition very useful in drop-forged parts where the draft of the forging can be used to advantage. The vee illustrated is backed up by the casting of the jig or fixture, and only one dowel is used. Two dowels are not necessary in any block that is located against a finished side. The vee shown in Fig. 6 is adjustable, the screws being positioned in elongated slots and backed up by a headless screw similar to those shown in Figs. 3 and 4. This type of vee is probably used more than any other in jig and fixture construction. The block has a tongue on the bottom, which keeps the vee square with the slot. The tongue can be omitted by having the edges *A* and *B* ground, and the whole block set in a slot. In Fig. 7 is illustrated a vee that is semi-floating, the slots for the screw being in an opposite position from those on the one shown



Figs. 1-7—Types of pin- and V-stops for jigs and fixtures

The fourth article. The fifth will appear in an early issue.

in Fig. 6. This vee can float in either direction *A* or *B*, but is backed up by the casting, the same as the first type shown.

Stops for rough surfaces on small parts have to be placed very near together to form the three-point bearing, and this can be accomplished by using a shoulder bunter relieved on top as shown in Fig. 8. Heavy parts are often dropped when loading into fixtures, therefore the bunter or stop should have a large shoulder surface, and is sometimes made as in Fig. 9 with a rounded cone head.

To eliminate unnecessary tools, operations often call ror a part to be machined in a fixture, additional operations being performed in other fixtures, and then returned to the original fixture for the following operation. If a surface had been machined in the other fixtures that located against a stop in the first fixture, the part would not rest in its original position. Stops shown in Fig. 10 and 11 cover a condition like this, and are self-explanatory.

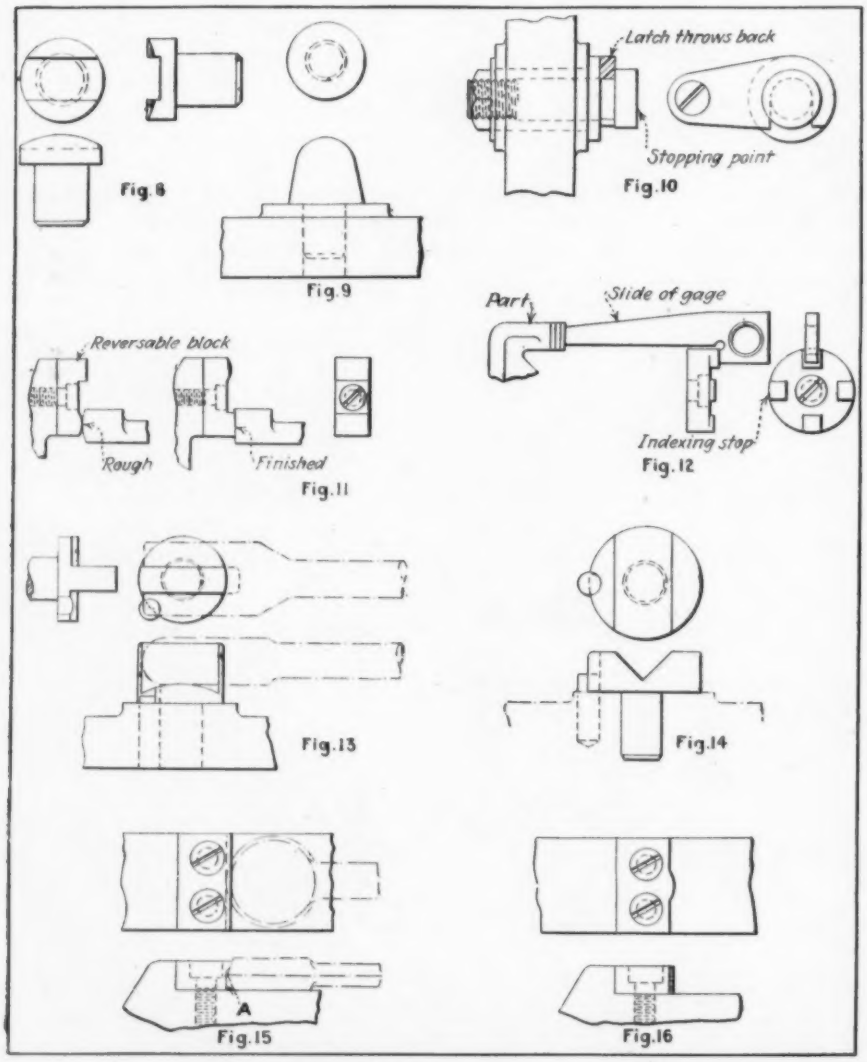
Parts are often made similar in all respects but one. This variation can be taken care of in gaging by a slide and stop as illustrated in Fig. 12. This stop can have any reasonable number of steps, whereby a number of parts can be inspected in one gage. Stops can locate and stop at the same time. Fig. 13 shows a stud that has a tongue which locates the part, the latter resting on a shoulder, and the stud being doweled by a pin to keep it in position. In Fig. 14 is shown how a vee can be made of simple construction and doweled into position.

The block illustrated in Fig. 15 acts as a stop, and also holds down the forging as outlined. It should always be backed up by the casting, and the screws should be kept as near the angle edge as possible. This block uses the draft on the forging to hold it to the seat. The undercut at *A* is made to clear the flash on the forging, a necessary feature if best results are to be obtained.

In Fig. 16 is shown a block similar to the block in Fig. 15, in that it is backed up and held down in the same manner, but this block has a rounded nose which will form a single point when acting as a stop. This nose can be made either plain or scored as shown in sketch, and may even be cut back on an angle to hold down the parts. A jig or fixture seat acts as a stop when it is made with a locating edge as illustrated at Fig. 17. This edge can be relieved as shown by the dotted line, in which case it will act as a two-point bearing.

The figure-four stop, taking its name from the similarity of its outline to the figure four, is probably widely known in plants that use milling machine vise jaws. A sketch of this is shown in Fig. 18, with a dotted outline of it in a second position. Assume that a part has to be straddle-milled in a vise jaw. The ordinary end stop would be in the way of the cutters, but if the figure four stop is used, the stop can be rotated to its second position after the vise jaws have been tightened, and the stop will clear the cutter. In laying out this stop, the hole is placed off-center with the stop end, and a spring plunger engages two spots on the under side of the stop. This plunger is covered at all times so that dirt or chips cannot work into the spring to stop its action. A particular advantage in this stop is that even if the operator forgets to move the stop to its second position after clamping, the angle at *A* would come in contact with the cutter, and the stop would be forced out of position, thus protecting the cutter from breaking. In Fig. 19 is illustrated a figure-four stop with an adjustable end provided for work that may be returned to the jaws for an additional operation, or to cover pieces of several lengths in the same jaws. The leaf shown in Fig. 20 is a throw-out stop that is often used in fixtures for straddle milling. It can be used as a straight edge to locate work as shown, or can be relieved to form two locating points as illustrated by the dotted line. This stop has to be thrown back by the operator, otherwise the cutters will run into it and be broken. It is positive in its location, and is to be recommended for that reason.

The plate, Fig. 21, answers the same purpose as the leaf in Fig. 20, with the additional feature of swinging on the shoulder screw so that if the cutter should hit it no harm would be done. It is not as positive in its location as the one shown at Fig. 20, the operator



Figs. 8-9—Pin stops for rough work. Figs. 10-12—Stops for parts with varying working points. Figs. 13-16—Special types of stops

having to set his work against an edge held only under spring pressure. The proper location of stops in a jig or fixture is an accomplishment that can only be acquired through experience. It is just as essential to have a stop in the proper place as it is to clamp properly, since much depends on the work not springing while in the tools. Particular care should be taken to see that the gate, vent, and snagged surfaces in castings, and the flash and sprue in forgings, do not rest against a stop. A burr on a steel part can also throw the part out of position if located on the stop. Many times the ideal place to locate a stop is just the place where it cannot be put, due to one of the above conditions. In Fig. 22 is shown a part with a stop, and the pressure from a clamp applied at the point of the arrow. This would be placing the stop in the wrong place, as the clamp would spring the part. If the stop is moved to the center line *A*, giving a direct thrust, the part will remain in its normal condition. If a part were located as in Fig. 23, the stop being lower than the clamping force, the result would be that the part would swing on the stop and lift off of seat *A*. The stop is put at the center line *B* to overcome this difficulty. These two instances give an idea of what to avoid, there being many such conditions in clamping and stopping work improperly, where a little thought will give better results. A three-point bearing might be termed an inverted stool, in that it allows a part in a jig or fixture to remain steady regardless of rough or unfinished surfaces. The part can be squared up longitudinally on two stops, another stop being required to locate it endwise. It is then clamped from both directions. In Fig. 24, at *A*, this point is illustrated. In Fig. 24, at *B*, is shown a part with the round boss located in a vee. In this case, an end stop is not necessary since the vee takes the end movement. Stops in some cases are located differently in the fixture for a part and in the jigs for the same part, due to thrusts from drilling, or to the position in which cutter enters in milling, attempts being made to eliminate chatter. It is better, however, when it can be done, to locate a part from the same surfaces for all operations in the several jigs and fixtures that are required to manufacture the piece.

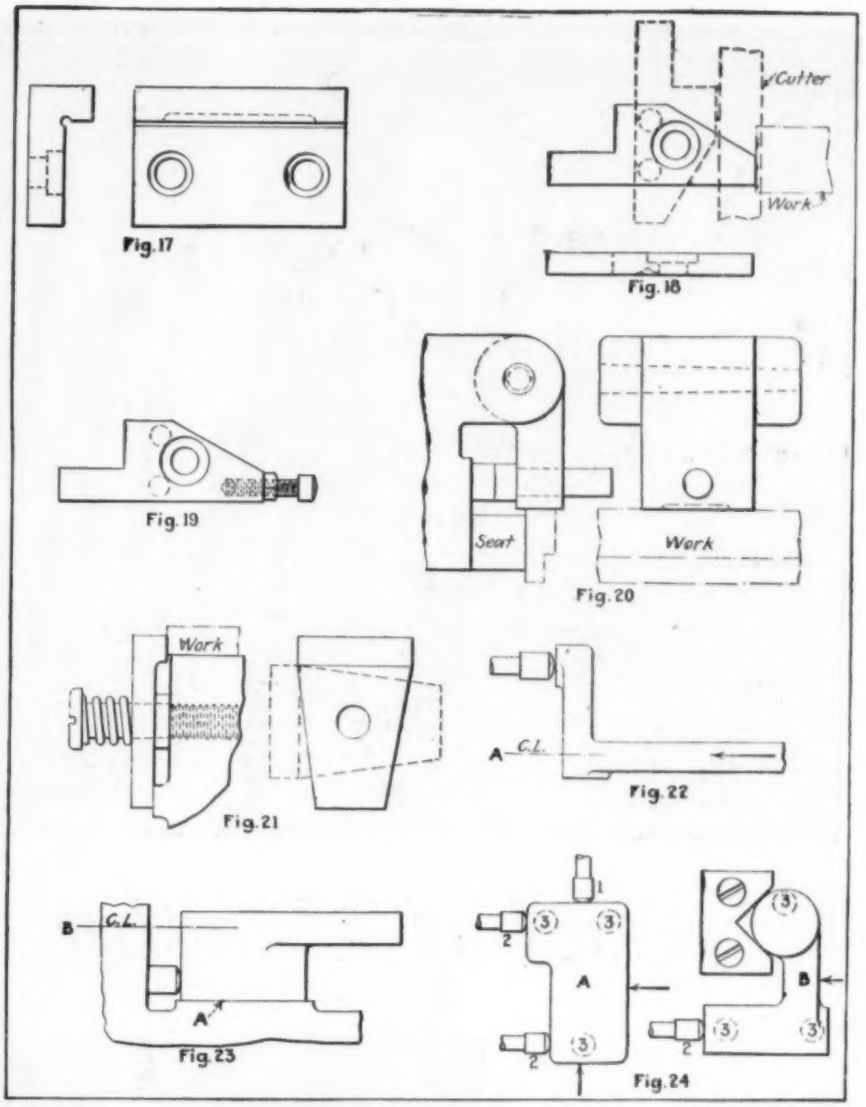


Fig. 17—A fixed seat stop. Figs. 18-21—Adjustable stops for milling vise jaws. Figs. 22-24—Incorrect and correct ways of locating clamping points

The Requirements of an Inspector

By Silas Williams
Gage and Inspection Division
Bridgeport District Ordnance Office

INSPECTION is the act of holding a careful, critical investigation. It is the duty and function of an inspector to make this investigation and to cull out that which will not be suitable. Though simple by definition, the position of an inspector is one that requires technical skill, good judgment, and a fundamental knowledge of the manufacture and uses of the parts. It is also important that he should have the ability to work in an efficient, peaceful way with the operating force.

The inspector is always in the unenviable and unappreciated position of umpire, either between the operating department and the specifications, or actually between the manufacturer and the purchaser of the article. Here are the six requirements that make the inspector one of the most important men in an organization:

1. He should have a mechanical turn of mind so as to grasp the tie-up of component parts with other parts.
2. He should have an analytical mind to study functions and requirements of a job.
3. He should be deliberate, to avoid being rushed off his feet by pressure from outside forces.
4. He should be tactful, to tell manufacturing organizations that a day's work is wrong without hurting their feelings or arousing antagonism.
5. He should have selling ability, in order to sell his opinions and rulings to others, rather than having to resort to forcible ways.
6. He should be systematic, so as to be able to keep the work moving in an orderly manner, and to see that repairs are taken care of promptly.

Fig. 1—Carrying large boring bars to the job. These tool racks are built on truck platforms and kept in the tool storage room ready for use. Bars are inspected and sharpened when necessary, after coming in from a job. When needed in the shop it is only necessary for the proper move man to take a lift-truck to the tool storage department, push it under the platform as shown, and move it to the machine where it is to be used

Photograph by courtesy of the Stuebing-Cowan Co.

Uses of Handling Devices

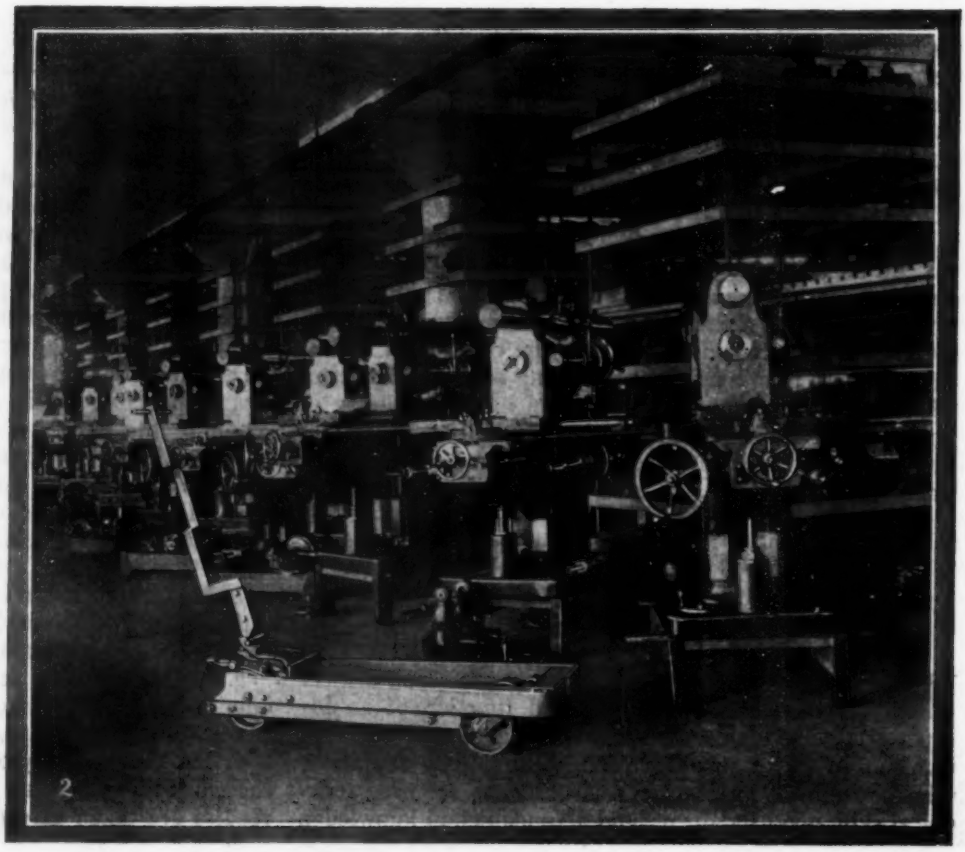


Fig. 2—Handling milling machines by lift-truck in the assembling department. This also shows the method of storing unit, or sub-assemblies, until needed for the completion of the milling machine. The machines rest on specially built platforms and can be readily moved to any desired location in the shop. A noticeable feature of the lift-truck is the peculiar shape of the handle which has been bent so as to clear hand wheels and other projections on the machine

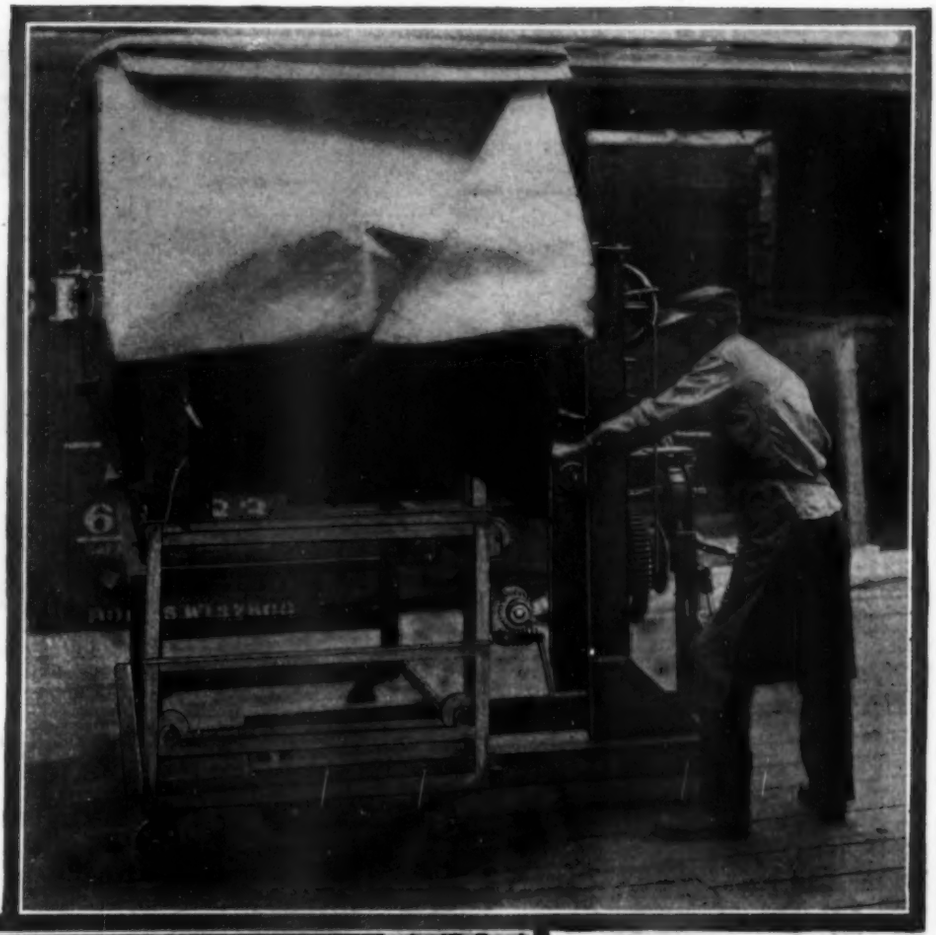
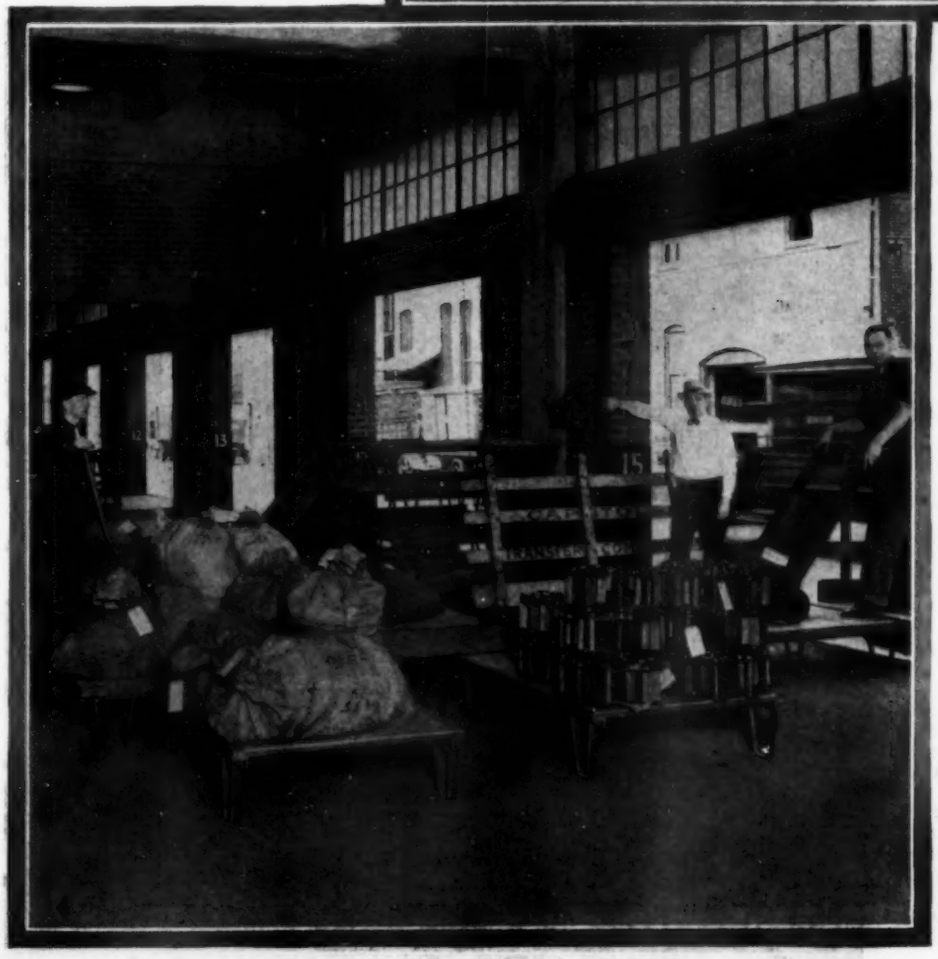


Fig. 3 — Lifting automobile bodies so as to transfer them to box cars for shipment. This shows the combined use of a special, elevating platform and of a hoisting machine that lifts the body off the platform and transfers it to the open door of the box car. The elevation of the body on its platform is accomplished by wire cable and worm gearing, while the elevating mechanism of the hoisting machine uses a spur gear reduction, in combination with a cable



Photographs by courtesy of the Lewis-Shepard Co.

Fig. 4—Using transfer platforms for various purposes. The height of these platforms just makes up the difference between the floor and the truck body, forming a very convenient runway for unloading material from the truck. From here it is an easy matter to put material on other platforms and to use them for temporary storage space. Unlike dumping material on the floor this does not involve another handling, as a lift truck carries them to any point desired

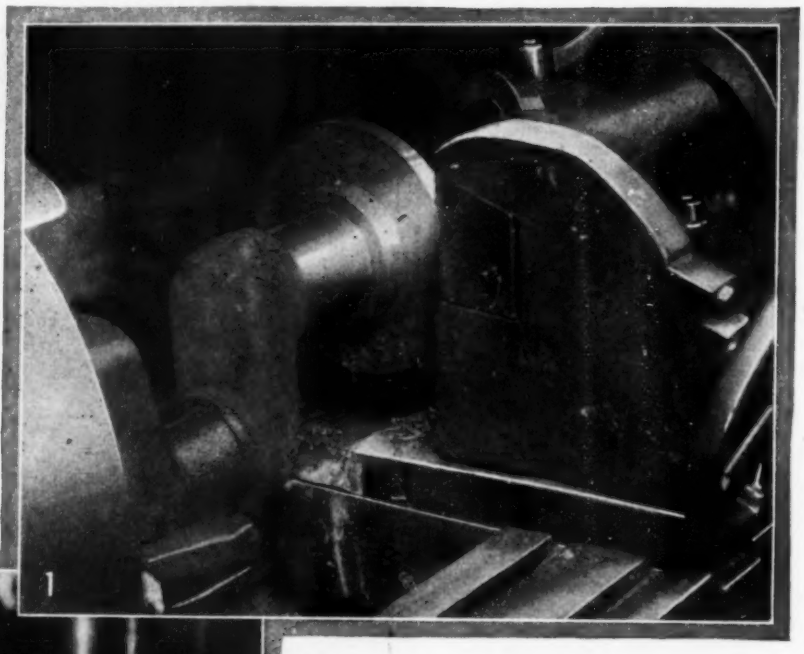
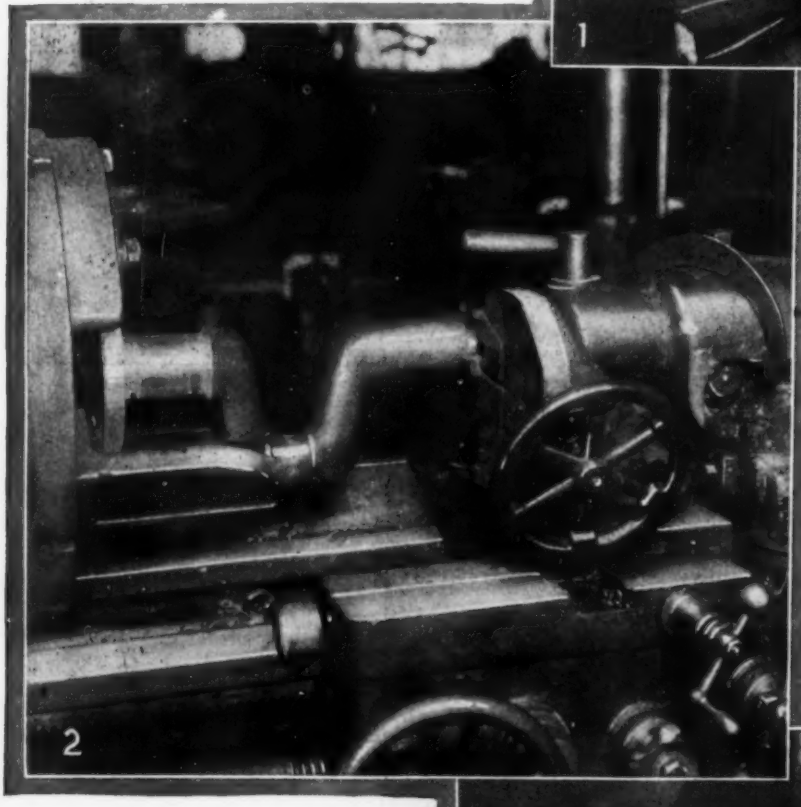


Fig. 1—Rough turning the flange and end bearing. Note special toolblock

Fig. 2—Turning other end of crank. Flange clamped on a counterbalanced faceplate



Crankshafts for Taylor Stokers

Photographs by courtesy of the American Engineering Co., Philadelphia, Pa.

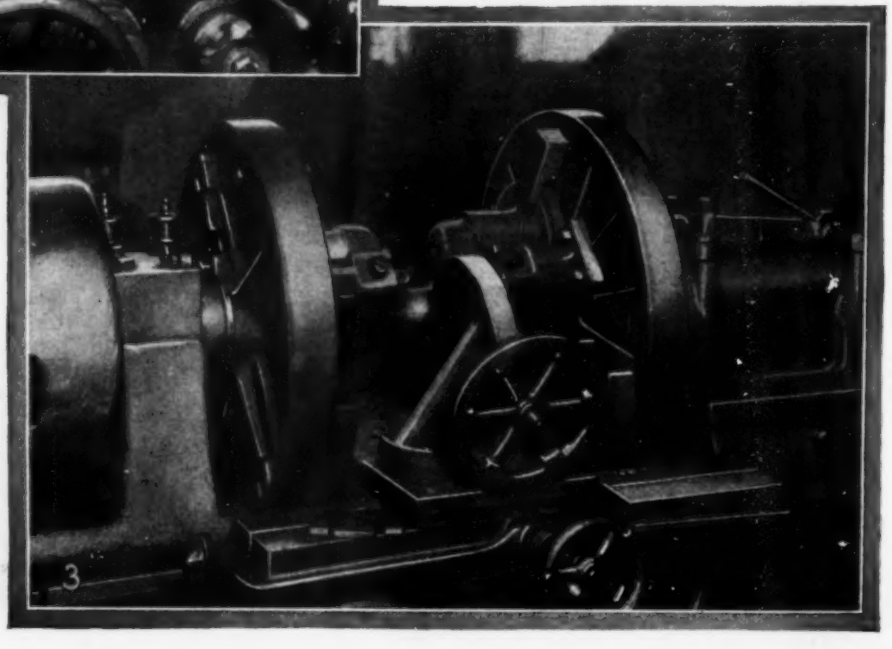


Fig. 3—Turning the crankpin. Crankshaft is held in special jaws on the two face plates, one of which is mounted on the end of the tailstock spindle. A special toolblock with screw adjusting wheel is used

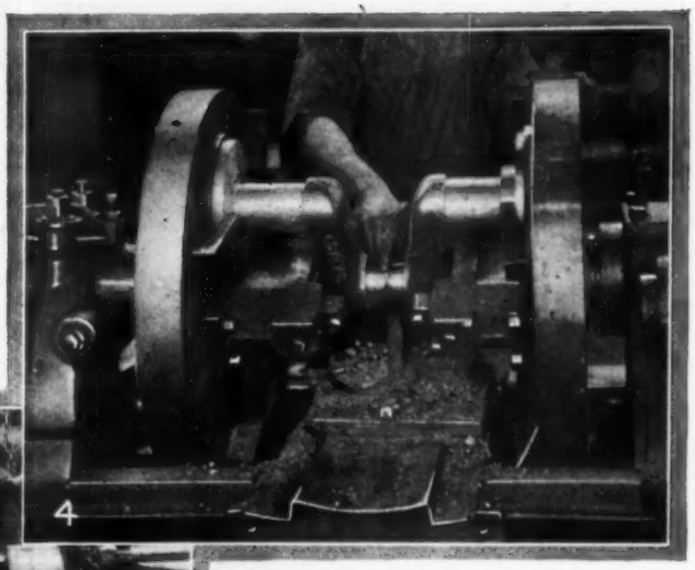


Fig. 4—Finishing the crankpin of a single-throw, double-flanged crankshaft. Flanges are held on faceplates and special jaws support the cheeks, or webs of cranks

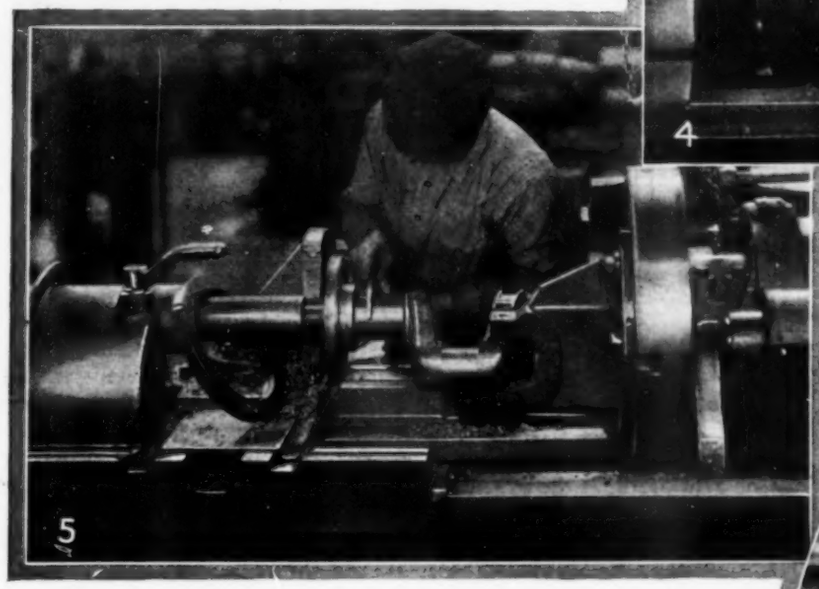


Fig. 5—Finish turning one of the end bearings. The crankshaft is located on centers and is supported by the flanged end nearest the faceplate. The crankshaft is driven by the forked angle plate bolted to the faceplate. The diameter of the bearing is carefully checked with snap gages

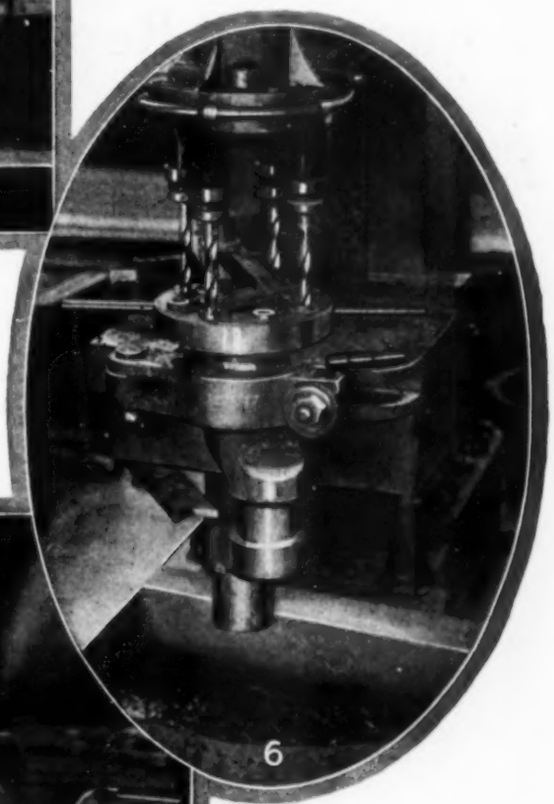


Fig. 6—Drilling eight holes in the flange with a four-drill head. After drilling the first four holes, a plug is put into one hole and the shaft is turned to bring the other drill bushings in line with the drills

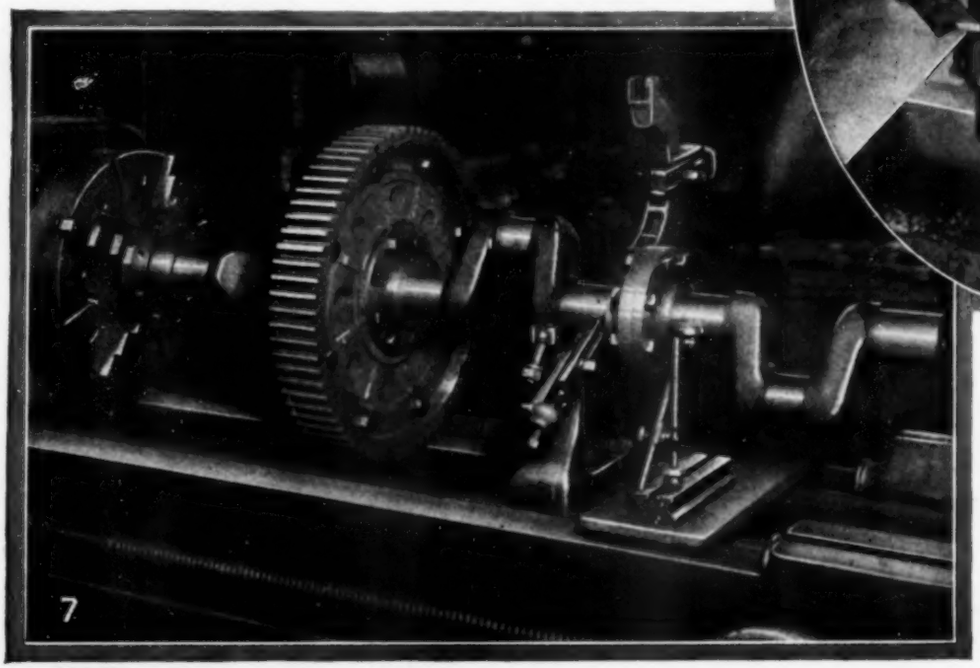
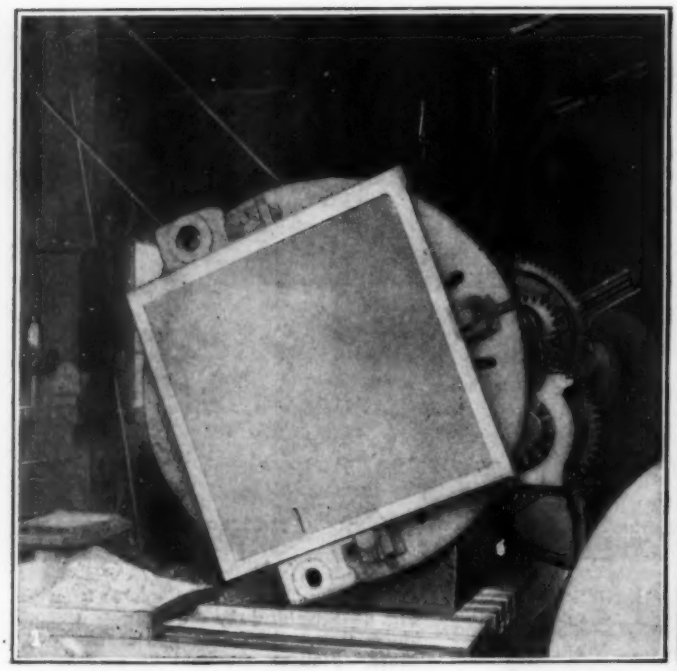


Fig. 7—These crankshafts are made up of sections and bolted together to secure the desired number of "throws." The alignment is being tested with a dial indicator. As the tolerance is only 0.006 in. at outer end, all flanged surfaces must be square



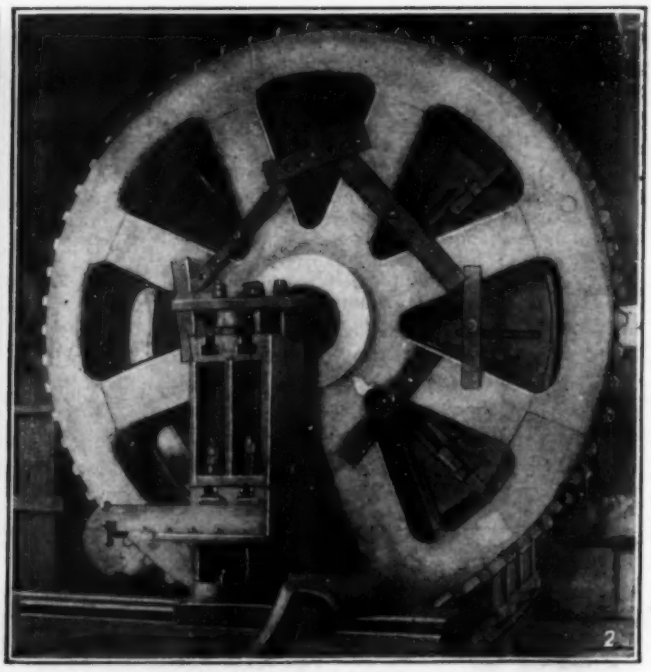


Fig. 1—Facing a pressure plate. Fig. 2—Boring a 12-ft. gear on an 8-ft. lathe

Sugar Mill Repairs in Cuba

JUST as examples of the kind and variety of work that is to be found in sugar-mill repair shops, I am illustrating four that drifted into one shop in Cuba, the "Fundacion Union," in Sagua la Grande, three of them during my short stay in that vicinity. A little study of these jobs will disabuse anyone of the notion we sometimes acquire, that the need for the old-time, all-around mechanic has departed.

In Fig. 1 is shown just a plain sort of job that might come into any shop—facing the sides of a pressure plate used in quantities in sugar-mill work. The only difficulty in the job is that both sides must be parallel and that it is not an easy piece to hold in the ordinary chuck, without springing it in some way. Then, too, the lathe had to be blocked up for this job.

The next lathe job, however, is not so simple, as is shown in Fig. 2. Here is a lathe with an 84-in. faceplate, blocked up to swing a 12-ft. gear. And the hole in the hub must be bored concentric with the gear teeth. The inside of the rim is supported by blocks between the jaws on the faceplate and the rim. These blocks help to center the gear on the faceplate. Straps hold the gear against the faceplate during the machining. The building up of the lathe is also shown by the toolblock height.

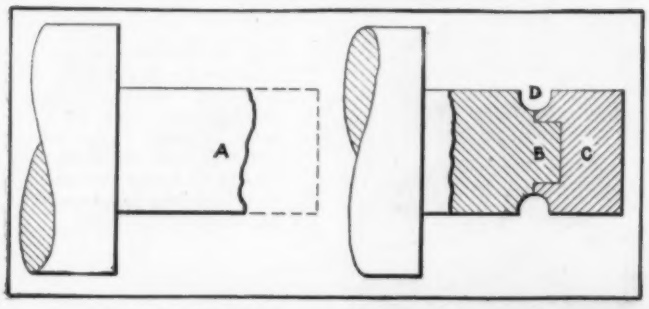


Fig. 3—Welding an end on a broken roll

Two other jobs were entirely different and much out of the ordinary. The first, Fig. 3, was a broken journal on the end of a crusher roll from a distant sugar mill. Since the pressure on these rolls runs up into the hundreds of tons, it is not surprising that they break occasionally. The method of repair is of interest. The broken journal end of the roll *A*, was turned down and faced as at *B*, and a piece *C* was turned up to fit on the end. This piece was shrunk on the end of the shaft and the space *D* was filled in by arc welding, being built up sufficiently to allow it to be turned down to the proper size of the shaft journal. The job was done in much less time than it would take to get out a new shaft, and time is the important element in the grinding season.

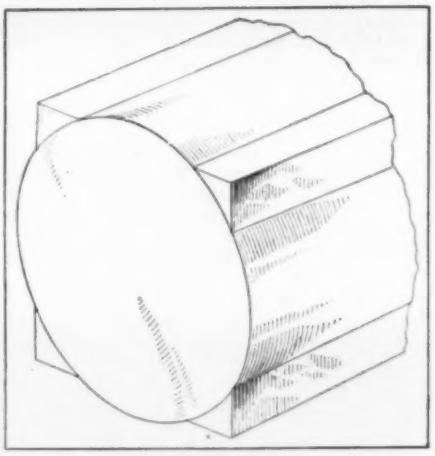


Fig. 4—Building a square on a round shaft

Another roll breakdown required entirely different treatment. The roll was a large one and the shaft had broken at the squared end where it fitted the hollow driver, or "muff," as it is called in the steel mills. The squared end measured 24-in. across the corners, and the largest shaft available was only 20-in. in diameter. But a little matter of four inches didn't phase Macfarlane of Sagua. Not while welders and electric current were on the job. He turned the body of the 20-in. shaft to fit the roll and built up the corners on the projecting end, as shown in Fig. 4, so that itfitted the driving coupling. The mill was only out of commission a few days.

Material-Handling Appliances in a Modern Department

A filtering and sterilizing system receives the flow of oil from the extractor and returns it to a portable tank in the department—Automatic machines used to pack parts into boxes

TO PRODUCE one hundred thousand handles per day, which is the present normal capacity of the Gillette Safety Razor Co. at its Boston factory, the building in which the handle-making plant is located is equipped with a system of conveyors to transport the work through its various stages from raw stock to finished product. Taking advantage of this system, an operator who has finished his or her part upon the work with which a pan, box or tray is filled, does not set the container upon the floor, but deposits it instead upon a conveniently located conveyor somewhere along the line of which the operator who has next to take the work in hand is ready to receive it.

Preceding articles have outlined the progress of the work up to and including the plating, at the conclusion of which process the plated parts are taken off the racks, arranged in wooden trays, and the trays are placed upon the moving platforms of a vertical conveyor by which they are taken to the polishing, buffing and burnishing department for further operations.

Though automatic and semi-automatic machines are employed to some extent in this department, the shape of the parts and the nature of the operations upon them at this stage do not so readily lend themselves to automatic handling as at other stages of the work. Wherever possible the various steps are so arranged that the parts pass directly from one operator to the next with a minimum of intermediate handling, and in some cases a horizontal belt conveyor is employed.

Lacquering machines in which the parts are handled on racks apply what is practically the finishing touch to the handles. These machines, one of which may be seen in Fig. 13, consist of pairs of chains connected together at intervals by cross-bars upon which the racks of work are hung. The mechanisms are wholly enclosed in metal chambers, in the sides of which are glazed doors and windows to permit supervision of the work in progress and provide access for loading and unloading. The chambers exclude dust, retain the heat necessary to harden the lacquer, and confine the somewhat oppressive fumes.

The carriers, consisting of the chains and their cross-bars, are endless, and travel slowly over sprockets at the tops and bottoms of the enclosed chambers in a zig-zag course covering the length of the chambers. The glazed sash at the left end of the chambers, as they appear in the illustration, may be raised like the sash of an ordinary window, and are the openings through which the work is introduced and removed.

An operator stationed at one of these windows takes the loaded racks from a group of operatives at a nearby

The third and concluding article.

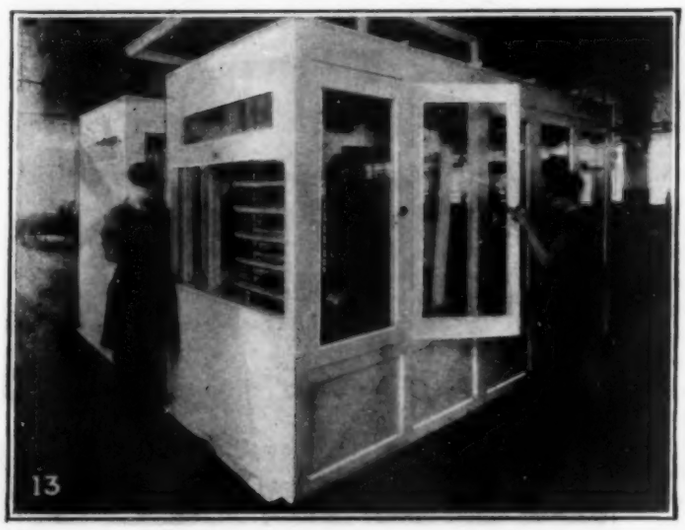


Fig. 13—Lacquering machines are enclosed by steel and glass to confine the heat and lacquer fumes, yet leave the work open to observation. The conveyor is loaded and unloaded through the window at the end. Fig. 14—Operatives wrap the handles in tissue paper and deposit the packages in pockets on the surface of a moving belt that is given intermittent motion. The belt is a part of the machine that puts the handles into boxes

Fig. 15—It is the duty of these operatives to keep the pockets in the belt of the packaging machine filled. As they become more expert at the job, a lesser number is necessary to keep ahead of the machine

bench and hangs them on the cross-bars of the carrier as it descends slowly before her, at the same time removing the racks of lacquered work from the adjoining bars. Having unloaded and reloaded as many of the bars as are for the moment within her reach, she closes the sash and waits until the carrier has advanced a distance equal to the height of the window before continuing.

At the bottom of the first vertical line of travel, the work dips into a tray of lacquer, from which it emerges at an angle that allows excess liquid to be drawn off without drip. By the time the work reaches the top of its angular course the excess lacquer has been removed and the work continues through the steam-heated chamber. When a rack reaches a position before the window on its return journey, the lacquer has hardened and the work is ready to be removed.

Wrapping the finished handles in tissue paper preparatory to packing them in boxes is a hand operation, supplemented by an automatic machine that puts the packages into boxes. Extending from the packing machine is a long bench at each side of which sits the dozen or more operatives necessary to keep one machine supplied with packages. In a groove at the middle of the bench is the upper side of an endless belt, *A* in Figs. 14, 15 and 16, which is a part of the machine and receives from it an intermittent motion. Blocks fastened at regular intervals to the belt form pockets between them, into which the wrapped packages are placed by the operatives.

The operative at the outer end of the bench is shown in Fig. 14 in the act of wrapping a package, which she immediately places in one of the pockets of the belt before her. However expert she may be, she could not possibly fill more than one-tenth of the pockets at the rate of speed for which the machine is set, but her many companions along the bench supplement her efforts, so that when the belt reaches the machine all pockets are filled.

The flexibility of the system is apparent. The supervisor has only to set a sufficient number of operatives at work to keep the pockets filled. If the operatives are all experts, a lesser number will be required; if they cannot keep up with the machine others are put on. Only the minimum number of operatives is employed, the supervisor at the machine having extra packages at hand with which to fill the pockets in case an operative is temporarily absent from her station.

A comprehensive view of the bench is shown in Fig. 15 with the machine at the farther end, and in Fig. 16 may be seen a part of the machine and a section of the entering belt. The machine sets up the boxes, pushes the packages into them and closes the ends.

Many things other than work in progress may be handled automatically. For instance, the screw-machine department uses many gallons of oil of a rather inflammable nature, and since the department is located on the fifth floor of the building, it would be unwise to store any large quantity in the immediate vicinity of the machines. A fifty-gallon portable tank contains all of the excess oil in the department, and this is generally empty. The real supply is in an underground tank five stories below.

Oil to fill the portable tank is drawn as needed from a pipe at one side of the room and the tank is wheeled to the machines where its contents are pumped into the reservoirs of the machines. Beside the outlet are the electric push buttons to control the machinery by which the oil is raised.

In a partly underground chamber opening from the basement of the building is the apparatus, shown in Fig. 17, for lifting the oil to the portable tank on the fifth floor, and for filtering and sterilizing the oil that is extracted from the work and chips.

On the elevated platform shown in this illustration are two 500-gal. receptacles, to either of which oil from the extractor in the screw-machine department may be drained. Both contain coils of pipe to which steam may be admitted to heat the contents to sterilizing temperature, and both have thermometers and gage glasses to apprise the operator of their condition. They are so interconnected by pipes that oil may be taken from either receptacle at will.

When one of the receptacles is nearly full, the flow of oil from the extractor is switched to the other one and steam is turned into the coils of the full one. After a lapse of some hours, during which the second receptacle is filling with used oil from the extractor, the clarifiers are started to drain the sterilized oil into the floor tank *A*, separating from it the impurities and sediment that has accumulated. The clarifiers are arranged in tandem and operate on the principle of a cream separator. The

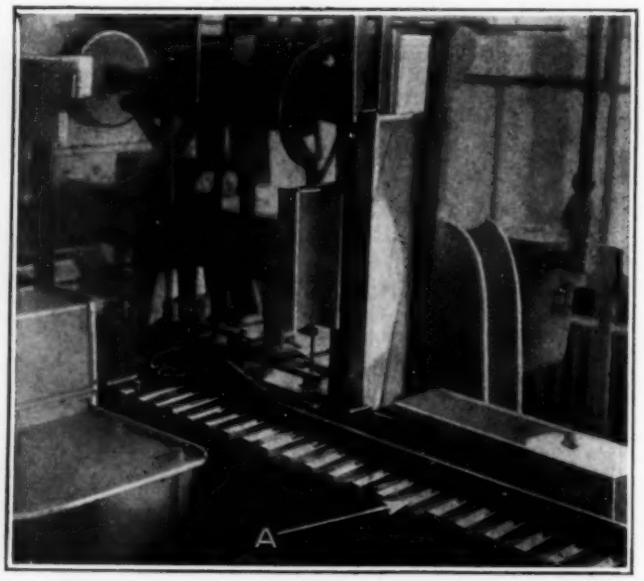


Fig. 16—The packaging machine sets up pasteboard containers, pushes a wrapped package into each, closes the ends of the containers and delivers them ready to be packed into cartons for the shipping room

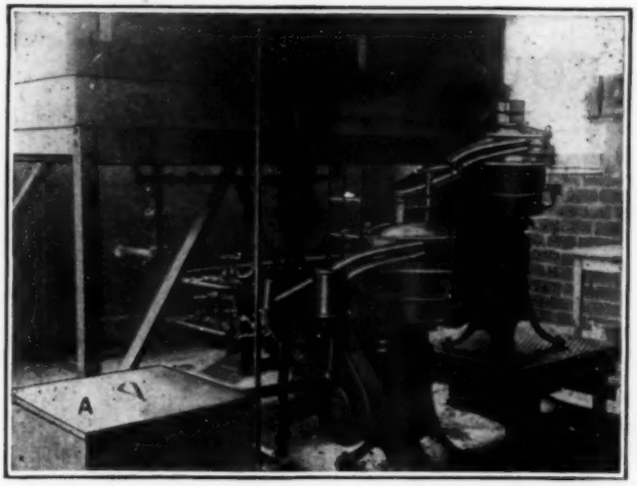


Fig. 17 — A sterilizing, clarifying and filtering system receives the cutting oil from the extractor in the screw-machine department and returns it to an underground tank, from which it is pumped as needed

first discharges into the second and the second into the floor tank. The residue from both runs to waste.

The floor tank is in direct communication with a 1,500-gal. tank underground, just outside the foundation wall. The piping and pumps are so arranged that in an emergency—as a fire in the building—the entire system can be drained of its contents in a very few minutes, the oil going to the underground tank. Acids are also stored in underground reservoirs and raised by pneumatic pressure to the plating room on the ninth floor of the building as they are needed. The illustration, Fig. 18, shows how the acid may be made to flow from a pipe in one corner of the plating room merely by opening a valve in an adjoining air line. The elevated container on the platform is merely a compensating reservoir, and contains all the free acid that is in the building at any time.

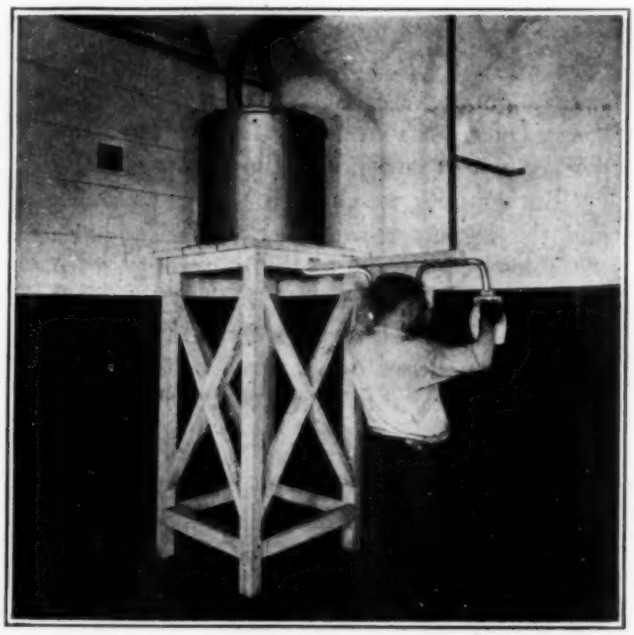


Fig. 18—Acid is drawn by air pressure from underground tanks as needed in the plating room. All of the free acid there is in the room at any time is in the container on the platform

Seen and Heard

By John R. Godfrey

Echoes of the Show

POWER required, more than any other single item, indicates the advances made in machine tools and in machining methods. The Cleveland Show emphasized this by requiring the installation of a 5,000-hp. transformer to handle the motors used in demonstrating the machines. And yet there were comparatively few very large machines in actual operation on regular sized cuts. Only 40 years ago a 25-hp. engine was an average installation for a 50-man shop on work of average size.

* * * *

Grinding has taken another turn upward so far as speed and production are concerned. Until rather recently a wheel speed of 6,600 surface feet per min. was considered about the maximum. Now, thanks to new bonds and methods of construction, some of the newer wheels can be run up to 10,000 surface feet per min., and, of course, produce a corresponding increase in work. Speeds of this kind, however, are not to be trifled with and not only require the right kind of wheels but proper mounting and guards that will actually hold the wheel should it by any chance happen to let go.

* * * *

Finishing gear teeth is still a real problem, not only to the builder of high-grade automobiles but to makers of other machinery as well. To cut accurate teeth and to harden the gears without distortion, has been the aim of those who are most interested. But since slight inaccuracies do creep into the cutting at times, and since steel frequently distorts in hardening, we have to resort to some sort of corrective process if gears are to be all we feel that they should be.

The old method was to run gears together with abrasive and oil. And we imagined that we were not only smoothing things out but correcting inaccuracies. According to the real gear doctors, however, we were emphasizing the defects and raising hob generally. So then we developed the machines for grinding the teeth after hardening, and also machines to roll soft gears between hardened master gears, before hardening.

Here again we find great differences of opinion. For while many makers allow the gears to float between hardened gears as they roll, others hold the gears on a mandrel while being rolled. As usual, there are differences of opinion as to the efficiency of the various treatments. The idea of rolling down the very slight ridges left in cutting is widespread, and many makers believe it to be well worth while. A few makers even go so far as to roll the gears after heat-treatment, with the idea of polishing the rubbing surfaces and so producing a smoother action.

There is always a new idea waiting for the man who keeps his eyes open.

Success and a love for one's job usually go together. Samuel Vauclain gives two rules for success in business: "Choose the kind of work you like and then pick the right sort of boss."

THE · FOREMAN'S · ROUND · TABLE

Foremen as Inspectors

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

THERE had been considerable discussion in the shop as to inspectors and inspection. There was apparently a growing antagonism, and Williams had been talking it over with various foremen.

"Has the super tackled you on this inspection business yet, Al? Seems to me all we need is a few inspectors who ain't so darn fussy. Our job is getting out production."

"There's more than that to it, Ed. Not much use in turning out a lot of pieces unless they will go together when they get to the assembly floor."

"Well, isn't it the inspector's job to see that they will fit?"

"Partly of course, Ed, but I'm not quite sure but we tie in on that too. Might have been better for the company if we had. Just remember, Ed, the company can only make its profit on complete machines that satisfy customers. Complete machines can only be made from parts that fit together. Isn't it better for us to turn out less pieces and know they'll be right, than to crowd a wad through and then have a lot come back? Spoiled work, or work that has to be done over, costs money even if the men do it over without pay."

"Don't you have troubles enough without playing inspector, Al?"

"We might have less trouble if we paid more attention to it. I'm beginning to believe that we'd all be better off if we kept a little closer track of the work as it goes through. It ought to make the men a bit careful, too. This waiting till a lot is completed before we know whether they are O. K. or not doesn't seem according to Hoyle."

"But if the inspector is onto his job, he'll catch the mistakes as they are made."

"Yes, Ed, but he can't gage every piece, especially on small work. The workman is supposed to keep tabs on it, of course. But if they were all hundred percenters they wouldn't need many foremen, and we'd be out of a job. I'm going to try and check up closer than I have so the inspector can't throw work back on us.

"It's his job to see that no defective pieces go into the complete machines. But isn't it our job to see that no bad pieces get to him to reject? It's a lot better to turn out only twenty good pieces a day than to get only twenty good pieces out of thirty, all told. Every piece that has to be scrapped or worked over costs money for the firm."

"But suppose we check the work as O. K. and the inspector rejects it, Al?"

"Then there's something wrong with either us or the inspector. Either his gages or ours are off. Or else we read blueprints differently. If we don't agree as to a piece being right, it's time for a conference."

Is Ed right in objecting to inspecting work of his department? Or has Al stated the case as it should be? Are there other sides to the question?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

What Is the Foreman's Job?

ED HAS given voice to an attitude held by most of the rank and file as well as many of the foremen and executives. He cannot be considered right in his conception of his job, nor should he be too severely criticized, as this is perhaps his first experience in this line of thought. It is possible that the superintendent did not lead up to the subject of his talk with his foremen regarding job analysis, in a way which would induce men like Ed to realize the real merits of the idea. On the other hand, he certainly caused a lot of thinking, which will without question, show in the reports of the foremen. All who have had experience with analysis will agree that in no other way can so thorough a knowledge of a subject be attained than by analysis, which means a complete study of all phases of the subject and all matters pertaining to it. Many a man has improved and advanced himself by self-analysis, perhaps without realizing what he was doing. And so, admitting the value of analysis, it will be recognized that an analysis of one's job, whether it be as an executive or one of less responsibility, brings out more clearly what the job really is, and its functions in co-operation with all others in the organization, and thus enhances the value of the man to the company. Following this same line of thought, the organization chart is really an analysis of the organization itself, and as such should be looked upon as a foundation for job analysis.

—IRVING F. MANDELL, *Engineer.*

THE · NEXT · TOPIC

Christmas Parties for the Plant

ADVANCE QUESTION

Al is enthusiastic about a management association report on Christmas parties in plants, but Ed is dubious. Are get-together socials "out of line" for the plant?

BY PUTTING down in black and white what the foreman is to do, what he would like to do, including the matter of suggestions, improvements, etc., the department head is better able to plan, and to allocate his own responsibilities. A chart, or some daily record of some kind, helps broaden the foreman in his work and views, encouraging more respect for system.

—FRANK V. FAULHABER.

Posting Too Many Rules

THE foreman is the keystone of the arch as far as the organization of his particular shop is concerned. For the greatest efficiency, the men should look to him for all instructions. True, there are many matters which must be coordinated throughout the entire plant, and the orders for these originate with the shop superintendent, personnel manager, safety engineer, or others. It is better, however, to have the foreman receive and carry out these instructions, rather than to post them over the signatures of the various officials. When they are so posted, it weakens the prestige of the foreman with his men, and tempts the foreman to regard the posting of them as sufficient activity on his part toward carrying them out. It also leads everyone into the bulletin habit, which is a bad one, and grows worse with time.

—KARL NIXON.

Getting Ideas from New Men

I AM of the opinion that it is good practice for a foreman to ask for the ideas of men working for him on problems pertaining to his work. This I think is not only good because it is quite often fruitful, but also for the effect it has on the men. I have often found that after I had worked out a problem in my own way, I would hear of several suggestions that would have been well worth hearing sooner. This is not because they do not wish to help, but usually because they think being new men it is not their place to make suggestions or because they feel that some idea better than theirs will no doubt be thought of. It is particularly well to get the opinion of the man who will use a tool when it is completed, because if he feels that he made a suggestion that was followed, or at least voiced his approval of the design, he will stretch a bit to make the tool work out satisfactorily. It is likely that a worth while idea may not be uncovered very often, but I do think that there is nothing makes a workman feel better than the fact that he knows his foreman thinks enough of him to seek his opinion, and in feeling that way a man is naturally going to think more of his foreman and his job.

—FERGUS O'CONNOR.

THERE are many men who hesitate to offer an idea, lest assistance of this kind be squelched, or even openly resented. When the foreman, however, comes with frankness and indicates desire for co-operation, urging the presentation of ideas, many of the men are certain to go out of their way to help. This makes for positive effect in the shop morale. The foreman of the department is sure to get more team work than is ordinarily possible.

—FRANK V. FAULHABER.

I THINK that Al was wise in getting the new man's idea, especially if he worked at a plant similar to this one and showed a good record. But in doing this, many things should be considered. Certainly, diplomacy must be used, because it affects men in various ways to have a foreman ask them questions. Some might get chesty and immediately think they are worth more money; some might not have any confidence in the foreman, while some might be crooked enough to carry tales to the fore-

man's superiors, often adding or subtracting enough to make it look as if the foreman did not know his job. Then again, there are those men who would appreciate having a chance to give out their ideas and offer constructive criticisms, and if given a chance to do a job in their own way once in a while, would prove more profitable employees. —RAY F. GOOD.

WHEN Al asked the new man about his methods, the latter felt that he was appreciated as a man. He expanded, and his confidence increased, also his ambition. He was established immediately on a friendly relationship. All these were a big help toward the achievement of his best. Giving a man leeway on methods makes him more contented. It minimizes irksome restrictions, and encourages initiative and interest in the work. It also keeps down the suspicion that the boss will not give him a fair show, lest he prove a dangerous competitor. —JOHN WOFFINGTON.

AFTER several experiments, I find that giving a new man who has had some previous experience in that class of work, free reign, is good policy. When handing the work to the new man, I explain to him the method which was formerly used, and about how much time it took. This precaution is necessary, for it will make the man think it over and compare both ways of doing the work. Even though no noticeable results are achieved, and the time is about the same, the satisfaction it gives a man to be able to use his own judgment will make him do his best. I have always found such men willing workers afterwards.

When it comes to production, it is the object of every foreman to get the work out in the shortest possible time. If that is accomplished, even if it was not the foreman's way of doing the job, nevertheless no credit can be taken away from him because of the fact that it was his judgment in the first place that induced the machinist to do the work according to his own plan.

—FRANK WALGENBACH, *Foreman.*

AL IS decidedly right about getting ideas from new men, as no foreman, no matter what experience he has had, can know it all about doing a job. I have worked in scores of different shops, and spent 52 years in machine shops of various states, and I have yet to find a man, be he the big boss, machinist, or apprentice, that at some time or another did not have an idea that I could use in the interests of the company I was working for at the time. No two shops have the same methods of doing work, and few companies are so narrow-minded that they will replace a foreman because he realizes the fact that he does not know it all. —C. H. FINK.

Keeping Track of Improvements

ANY practical draftsman can develop an improvement or correct a fault in the finished article, if it is shown to him. Therefore, the credit for the improvement belongs to the man that first thinks of it. It often happens that when the originator of an improvement is a mechanic, he has to take his ideas to the man immediately above him, who, after absorbing all the details, absorbs all the credit, too. Or, he may miss the main details altogether, and pass the scheme along in such a hopeless muddle that there is no credit for anybody. There should be a regular form in the shop, so that a man may secure for his ideas a fair and direct hearing. The credit will then go where it belongs, and this will encourage other men to try and make improvements.

—ERIC HAWTHORNE.

Tool Sales in the Shop

IN MY opinion, the shop should sell tools to the men. A considerable amount of time will be saved, as the men will always have the tools at hand, and any mechanic will naturally keep his own tools in order. The order for the purchase of the tools need not touch the usual buying departments, but can be dispatched straight from the shop by the foreman or somebody responsible, who can receive the tools when they arrive and collect the money for them. A tool club is not a bad idea, each man paying so much a week, and every quarter the club purchases the required tools as directed.

—W. E. WARNER, *England.*

SINCE the company buys the large tools, it seems logical to supply also the small ones. But the mechanic plays the principal rôle in the handling and care of the tools, and this is where the proprietary interest comes in. Although the purchase of a $5,000 tool is beyond the mechanic, he might desire occasionally to own a $5 one. He should be encouraged to do so, for ownership engenders the habit of careful usage of the company's tools, as well as of his own. It is not a question as to whether it pays or not on the immediate purchase of small tools. It might, indeed, pay the company to lose on these transactions, and the loss will be negligible compared with other gains. —F. C. EDWARDS, *England.*

Introducing the New Man in the Shop

BESIDES acting like a gentleman, Al did not lose sight of the fact that the new man and himself were expected by the company to pull together. His attitude established the feeling that the man was in a friendly atmosphere, and encouraged him to give of his best. As for Al's friend, Ed, I have not much use for him, although many of his kind exist in the shop. Looked at from any angle by the company, Al is a greater asset to its progress than Ed. —TREVOR BONSALL.

Saving Money with a New Machine

GENERALLY speaking, no man in the shop wants to be hampered with a notice advising him the cost of his machine or what he has to do on it to make it pay. Nevertheless, he certainly does like to know, and this information coming from the foreman allows him to formulate his own opinion as to hourly rates, and these particulars become shop gossip without advertising.

The foreman will see that the machine "earns its salt," as he will set the price of the jobs done on it accordingly. The workman has to know all about cost and output, if he wishes to get a higher job. But just leave that to him, and he will find out in his own way.

—J. WILSON, *England.*

Ideas from Practical Men

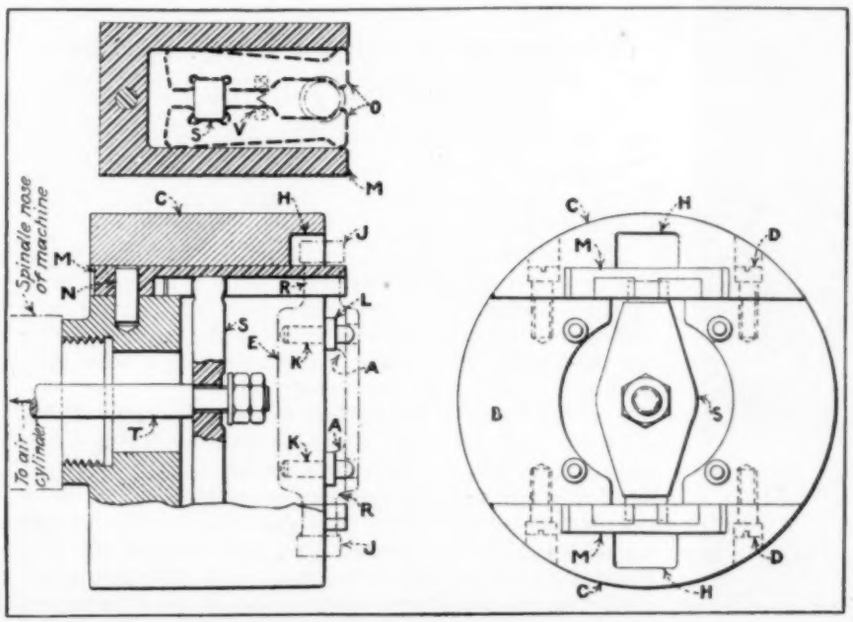
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

An Air Chuck for the Turret Lathe

By B. J. Stern

An air chuck for holding a brass casting during machining is shown in the illustration. The casting, shown in heavy dotted lines, has four equally spaced holes that have been previously drilled in the four lugs *A*, and it is now necessary to bore the interior and finish the face in a turret lathe.

The body of the chuck consists of three parts, the central casting *B*, threaded at the back to fit the spindle nose of the machine, and the two steel caps *C* that form a circular body when attached to the center part by screws *D*. The central portion *B* is cored out in front to admit the body *E* of the work, while the caps *C* are cut out in front as at *H* to clear the projecting spuds *J* of the work-casting. On the face of the center part *B* are driven the four shoulder pins *K*, the heads of which fit the previously drilled holes in the work, while the shoulders *L* provide seats for the bottoms of the four lugs, in which holes have been drilled. The bottom faces of the caps *C* are milled to receive the plates *M*, which are held on the pins *N* driven in the casting *B*. These plates are cut out to admit the hardened jaws *O*, which are shaped in front to suit the spud necks *R* of the work-casting. The jaws are milled in the back to fit the ends of the spider plate *S* that fits over the shaft *T*. This shaft is actuated by an air cylinder, not shown in the illustration, and in moving back and forth it actuates the jaws. In operation, the shaft *T*, being as far forward as it will go, shoves forward the jaws *O* which, actuated by the spring *V*, will have spread far enough, having cleared the front of plate *M* to admit of the casting being placed over the pins *K*. The air cylinder is actuated by a valve, causing the shaft *T* to pull back the spider *S*. This forces back the jaws *O* which, riding on plate *M*, close in around the necks *R* of the work-casting, pulling it back against the seats *L* on the pins *K* and holding it securely during the operation. To allow for variations in the work-casting, the plates *M* are free to move slightly in their seats in the caps *C*, thus giving the work a chance to centralize itself.



An air chuck for the screw machine

Grinding Sharp Corners and Snap Gages

By John J. Kauffman

Theoretically speaking an interior sharp corner cannot be produced by grinding, but it is surprising how close to perfection it can be approached.

Many tool and gagemakers use a hard wheel having a medium fine grain. An elastic wheel is also employed by others. Hard wheels are not free-cutting and when in contact with the work they spring away to a certain extent and leave an inaccurate job. This is especially true in grinding snap gages having narrow slots.

T-shaped wheels often cause trouble due to their springiness, and elastic wheels have a tendency to glaze quickly. A good wheel to use for this purpose is one about equal to a Norton Alundum No. 3846H. Such a wheel is soft and free cutting. The sides of the wheel should be reduced in thickness until it will enter the slot. It should have clearance from the extreme corner toward the spindle, far enough to clear the work. The face of the wheel should then be dressed. For good results the diamond must be sharp. A spring should be attached to any adjacent part of the machine, allowing the free end to bear against the end of the spindle to take up end motion. Many workmen place a hardened ball in the center hole in the end of the spindle and allow the spring to bear against it. A wornout blade from a power hacksaw will do for the spring. The work should be rough ground, after which the wheel should be trued. Approach the work very carefully from the side until the wheel begins to ring. It is very likely that there

will not be spark enough to show, except in the dark.

If the wheel is brought against the work hard enough to cause any amount of sparking, the corner will be torn off at once and it will have to be trued again. Feed slowly into the corner of the work while moving the table back and forth until the bottom is reached. A second attempt may be necessary to secure a good corner. The trick lies in using the ear to tell when the wheel is at work and how much work it is doing.

For grinding snap gages, or work of that class, the corner of the wheel is not so important. It is necessary only to have the highest point of the wheel come in the clearance cut at the bottom of the slot.

Once the mechanic has learned to use a soft wheel he will never return to a hard one.

An Improved Threading Tool
Discussion

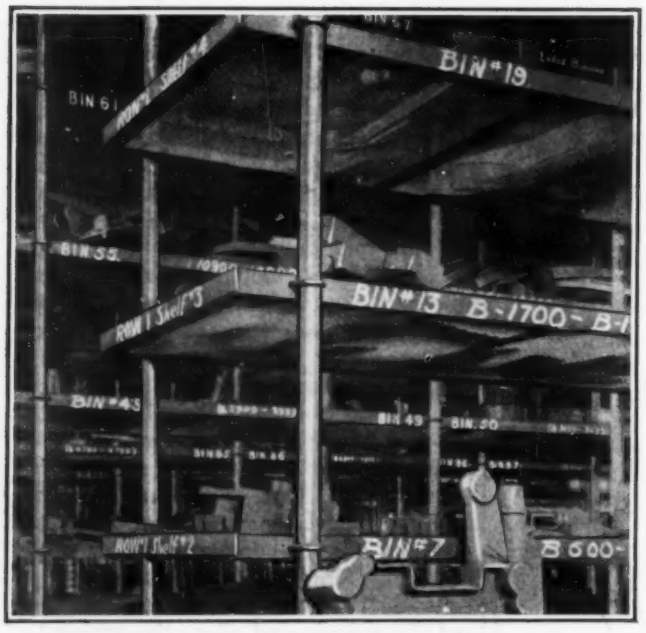
By Thomas Fish

Referring to the article by George H. Feltner, under the title given above and published on page 241, Vol. 67, of the *American Machinist*, it is evident that Mr. Feltner is not acquainted with the spring threading-tool made by the Ready Tool Co. In this tool a Woodruff key is used for the same purpose as is the plate in the bottom of the tool described by Mr. Feltner.

Storage Shelves for Patterns

By Oliver Franklin

In the accompanying illustration is shown a form of storage shelves for patterns that have several advantages: There is plenty of light available. They are cheap, since standard pipe and angle iron enter into their



Simple form of storage shelves for patterns

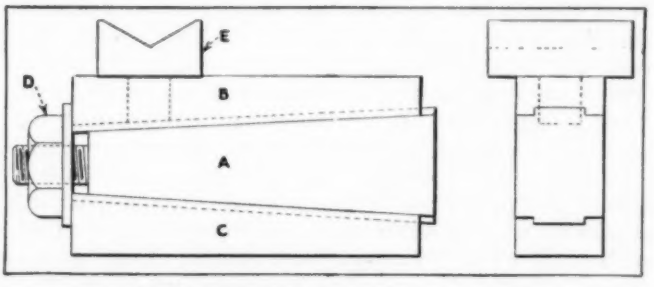
construction; and the wire-mesh trays allow any foundry sand that might be present to drop through to the floor where it can be easily swept up.

As can be seen, each shelf consists of an angle-iron frame bolted together at the corners and braced with cross strips set up in pairs with the screen between and bolted to the angle iron to form square sections of screening. A coarse wire screen of sufficient strength to resist sagging under an accumulation of patterns, is used. It is held in place with bolts and washers spaced about 6 in. apart. The shelves are supported on pipe running from floor to ceiling and spaced on 6-ft. centers lengthwise and 4-ft. centers crosswise. Standard U-bolts are used to fasten the frames at convenient heights. The position may be readily adjusted by loosening the U-bolts and shifting the frames either up or down. The angle-iron frames afford a convenient place on which to paint the proper identification marks.

An Adjustable Set-Up Block

By E. Swartz

In planer, shaper and drill press work there is often required a large variety of blocks, parallel strips and other fixtures for use in aligning the various odd shaped castings to be machined. The accompanying sketch shows an adjustable fixture, several of which will be of advantage to have for the various machines and on erecting floor. It is made in three principal parts, of cast



Adjustable block for setting up work

iron and is finished all over. The part *A* is tapered and is tongued on the tapered sides. The parts *B* and *C* are grooved to fit the tongues on part *A*. By manipulating the nut *D* the part *A* can be moved in or out, expanding or contracting the parts *B* and *C*, thus securing a fine adjustment. A V-block attachment can be added as at *E*.

Spacing and Cutting a Large Ratchet Wheel in a Job Shop

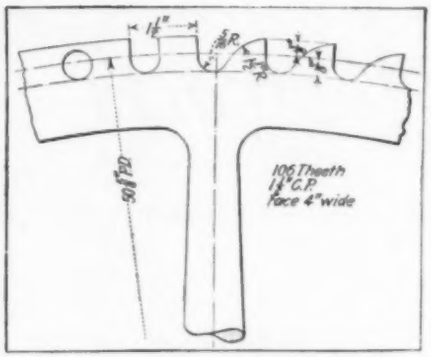
By H. K. Griggs

The sketch herewith shows an unusual job for a shop that is not equipped with gear cutting machinery. It is a cast steel ratchet wheel, used in a feed mechanism.

The casting was turned, faced and bored in the usual way on a vertical boring mill, and while still on the table of that machine the uppermost face of the rim was coated with copper sulphate solution to facilitate laying out the teeth. Pitch- and full-depth circles were then scribed by using a sharp-pointed tool.

The first step in laying out the teeth was to divide the pitch circle into four equal divisions by laying intersecting lines across the center of the wheel. At diametrically opposite ends of one line 1½ in. spaces were laid off each way, while at the ends of the line at right angles, divisions were made ¾ in. each side of the line. These latter points of intersection with the pitch circle served as checks in spacing 53 divisions, and by bisecting the 53 divisions 106 teeth were then laid out.

By using a 6-in. center square the lines for the straight sides of the teeth were then drawn. By means of dividers, $\frac{5}{8}$-in. circles were drawn tangent to the straight lines to locate the bottoms of the teeth. The wheel was then placed under a radial drilling machine and $\frac{5}{8}$-in. holes were drilled as located.



Cutting a large ratchet wheel without a gear cutter

A short piece of shaft of large diameter was then shouldered down to fit the bore of the wheel, leaving a flange at one end by which it could be secured to and trued up on the table of an 8-ft. boring mill that was provided with a slotting attachment. Bolts and U-straps were used to fasten the wheel to the table.

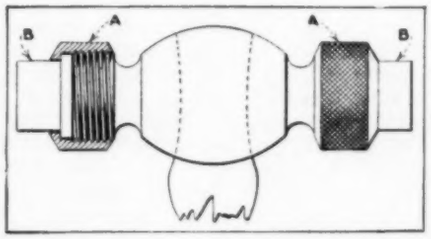
A round-nose tool of $\frac{5}{16}$-in. radius was used to cut a straight-sided slot from the periphery of the wheel to each of the $\frac{5}{8}$-in. holes, after which a form tool of the shape of the tooth was used to make the finishing cut.

Toolmakers' Hammer

By Jim Henderson
Toronto, Canada

A hammer for use on objects that cannot be struck with a hand hammer without injury, is shown in the accompanying sketch.

The head is threaded at both ends to receive the knurled retaining-nuts *A*, by which properly shaped pieces of any material, as at *B*, can be held firmly. Such an arrangement makes it possible to use pieces of copper, brass, lead, fiber, raw hide or other material that will not damage work upon which the hammer is used.



A hammer for toolmakers

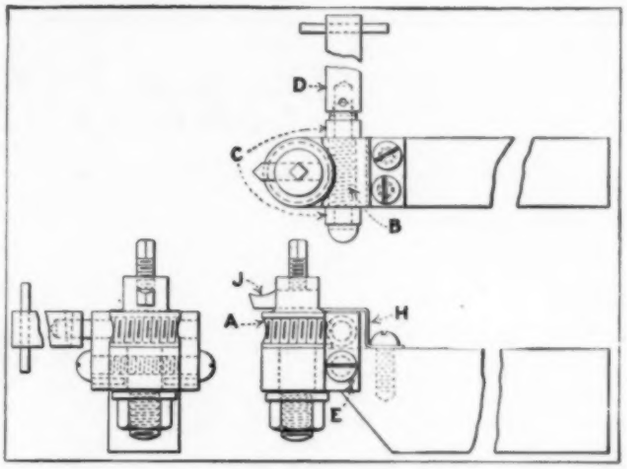
Pieces of material varying in hardness can be used on opposite ends of the hammer and the pieces can be changed for others of different material at will.

Tool for Turning Fillets of Short Radii

By P. H. Pearson

Some time ago it was necessary to turn some fillets of short radii on valves.

To avoid the expense of making a number of tools that might not be used on any other job, I made the adjustable tool shown in the sketch from odds and ends on the job. The combined wormwheel and toolholder *A* was made from tool steel to eliminate excessive wear. The teeth being cut by a $\frac{3}{8}$-in. tap revolved between centers in a lathe. The worm *B* was an ordinary $\frac{3}{8}$-16 screw, turned on the ends to fit the bearing *C*. The handle *D* was pinned to the end of the worm to enable the operator to turn it. The bearings were screwed to the toolholder and doweled at *E* to keep them in position. The guard *H* was placed over the worm to keep out the chips. The cutting tool *J* was made from $\frac{1}{4}$-in. toolbit stock.



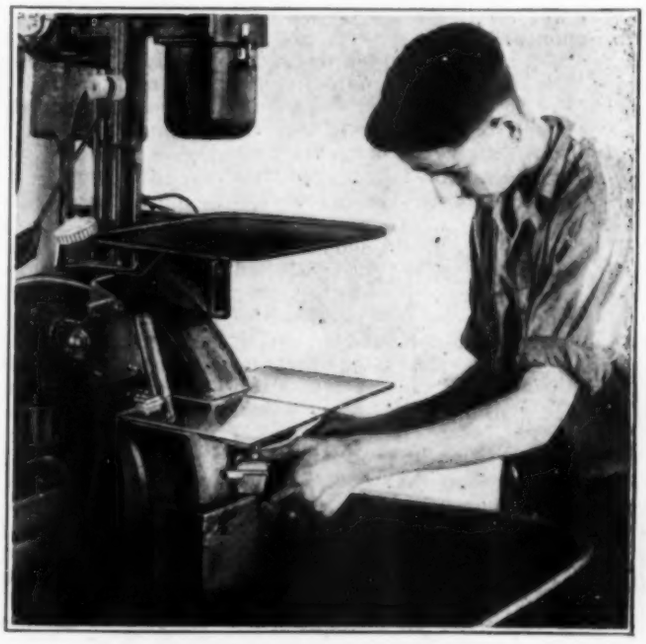
Adjustable tool for turning fillets

Improved Safety Shield for Grinders

By C. Sackett

Glass shields on grinders to protect the operator's eyes from flying particles of abrasive are usually mounted in an inclined position, and the reflections in the glass often make it hard for him to see the tool he is grinding.

The illustration shows an improved method of mounting such shields, as used in some of the plants of the General Electric Co. The glass is mounted horizontally and a black guard is placed several inches above it. The only reflection in the glass is that of the guard, and, being black, it reflects no light and therefore offers no obstruction to the vision. The guard is bound with rubber hose, so that the operator will not be injured if he should come in contact with it.



An improved safety shield

Technical Abstracts

Problems of the Stores Department

Material and supply expenses absorb about 29 cents of every revenue dollar earned by the railroads. The supply department of a railroad is a department of service, and is only as good as the service rendered to the owners, measured by turnover, and to the using departments by meeting their requirements. Of vital necessity to economic results in the supply department is a willing intelligence and sympathetic co-operation on the part of the management and users of materials. Supervisors of using departments should make periodical checks of stock carried in order to assist in proper ordering. The supply department cannot be expected to meet unusual heavy demands without a forecast, except at the expense of a considerably larger investment than required.

To place materials in the store room, as compared with delivery direct to users, adds to the cost of the material an amount equal to the charges for maintenance, depreciation, insurance and taxes on buildings and equipment, and cost of clerical work in maintaining records. If materials are being received that do not appear to give proper service, it is the duty of the using departments to direct attention to the fact. The cost of materials is not the purchase price, but rather the amount paid for them plus the expense of storing, handling and recording. A business, to progress, must be careful at all times to limit its commitments to its income before, and not after, they are made. The using departments play a big part in this, and must assume their share of the responsibility by giving advance information as to materials required, improvement work, car program work, and special jobs, so that arrangements may be made to co-ordinate as near as possible the delivery of materials with the disbursement for labor. Material and labor expenditures should always travel together.

The supply department should be in charge of all unapplied material and supplies, regardless of whether they are at storehouses or out on the divisions. There is no necessity for having materials strewn along the railroad, improperly protected and accounted for, and the using departments should be only too glad to have the supply department carry out its proper function.

Another problem that is before the supply department is what materials should be manufactured by them and what savings, if any, accrue therefrom. This is a problem that is not readily answered, because railroads do not maintain real costs on manufacturing. That some degree of success is attending the efforts that are being made by the railroads to reduce the vast investments carried in materials is evidenced by the reduction in inventories from $755,000,000 in 1920 to $526,000,000 in 1926. No definite figures are available as to costs of operations carried on by the supply departments, but it is fair to assume that they have also been reduced.—A. L. Sorensen, *Railway Age*, Oct. 29.

British and American Shop Equipment

At a meeting of the Institution of Production Engineers, it was suggested that an educational committee be appointed to formulate both a definition of a production engineer and a course of training for those who desire to become one. Such a course should include the theory and practice of inter-factory and inter-machine conveying and transport; the theory of economical plant layout and the relation of capital to revenue. It is believed that training of this kind would save considerable time by making the student appreciate the reason for factory organization.

The designer in America has learned to adapt his ideas so that they can be readily manufactured. Machines must be kept in operation continuously, eliminating or reducing idle time to the lowest possible figure. Loading positions are a feature in jig design and in order to keep a machine at work, two or three operators are frequently employed.

One cannot help but be impressed by the facility and general sturdy construction of the machines used in America. This applies not only to major but also to minor operations. One is bound to say that the requirements of American automobile manufacturers are more readily fulfilled in the States than are ours on this side. Practically no English machine can be found in American automobile plants. This is not a question of high tariff walls or any prejudice against British-made goods. If we could produce machines which could be operated more economically or to finer limits than the American machine, a ready sale would be found for them.

The opposite of this is true in British automobile plants. In spite of our sympathetic endeavor to give British manufacturers every opportunity of obtaining orders for the equipment of our new plants, over 50 per cent will probably have to be placed abroad. Constructive criticism from the members of this institution should be of advantage to the British machine tool trade. Practical men from high production factories should aid in designing and bringing specialized machines to the attention of manufacturers in this country.—*The Automobile Engineer*, C. R. F. Engelbach, Works Director, Austin Motors, Ltd., October.

Needed: A New Man of Business

The Industrial Revolution unquestionably left a trail of black results. The business men who lived through its early days displayed neither the historian's hindsight nor the statesman's foresight but their sins were of the type commonly found in any pioneer movement and need not be continued now that the pioneer stage has passed. Self-correction of these evils, which is now going on, constitutes the second stage of the Industrial Revolution. It is being pushed by enlightened self-interest and technical progress.

There are not more than 10,000 businesses doing more than $1,000,000 of business a year. The heads of these businesses are determining the character of our machine industry. Not more than 1,000 of them are the real leaders of American industry. If they would get together openly and co-operate, they could direct the course of machine industry for the next hundred years and eliminate most of its drawbacks.

In contrast to the old business man who spent the first three-quarters of his life making money to be spent in charity during the last quarter, the modern business man looks upon his business as his best instrument of public service, far more important than the committees on which he serves or than any private charities. If he wisely manages a great venture he can raise wages, shorten hours, lower prices and increase profits. He realizes that the politics and psychology of industry are as important as its economics. He is mainly concerned with two things: the system of work and the soul of the worker. He accepts the challenge of leadership.

His most difficult task is to preserve the balance between tradition and change. Experience has taught him that expert knowledge is not enough if its possessor is tied too securely to tradition. In one respect big business men are more radical than the Bolshevik. They pay large sums to investigators whose job it is to find better products and better ways of making them—in other words, to root out tradition. They are working toward the stage where they will be as hospitable to soundly conceived change outside their business as they are to change inside.

The new business man does not dread the dangers of increased leisure. He seeks means to improve it in the belief that we can build a better civilization in prosperity than in poverty. He no longer hands this problem over to the preacher and the school teacher, he attacks it himself. He promises to prove at last that a commercial civilization can be a great and glowing civilization. —Glenn Frank in *The Magazine of Business*, November.

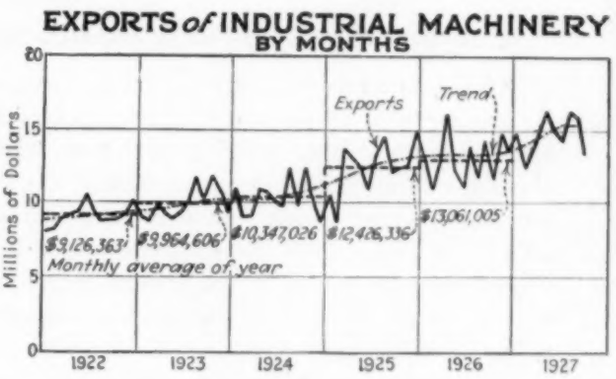
Activity in the Metal-Working Industries

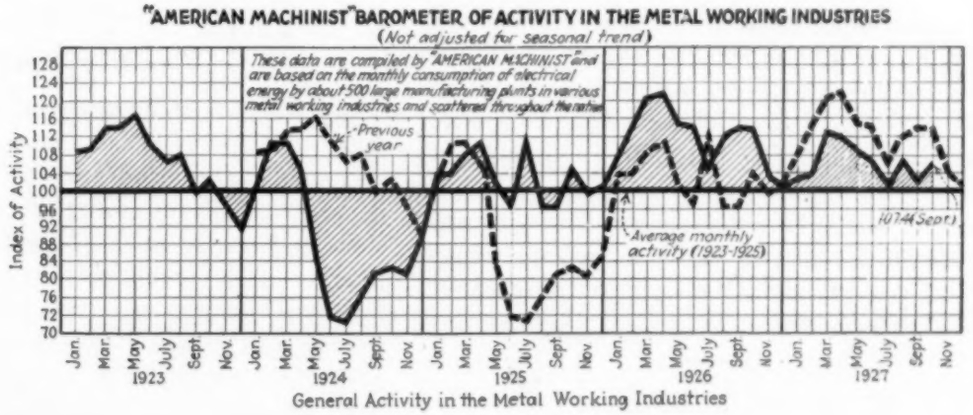
Production Movement Upward

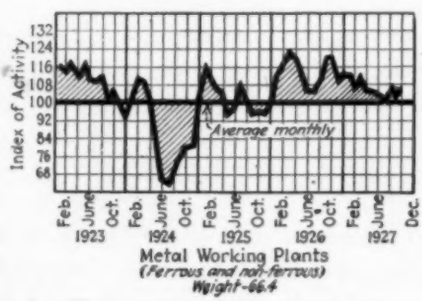
As was expected at this season of the year there was a slight increase in the operations in the metal-working industry. Reports on electrical energy consumption made to the *Electrical World* by these plants indicate that October activity was 4.2 per cent greater than that of September, but was 6.5 per cent below that of October of last year. The metal-working plants as a whole, which group includes railroad repair shops and automobile manufacturing plants, have been reporting activities below those of the same month of last year ever since the opening of the current year. The peak of activities during the current year was reached in March, following which a downward trend was reported which extended to September. In October, however, an increase in activities was indicated.

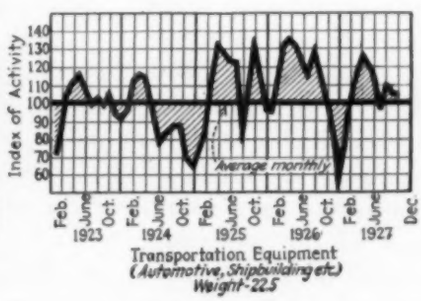
The upward trend in October in the activities of the metal-working industry is a reflection of the increased activities within the metals group as a whole, which includes the rolling mills and steel plants as well as the metal-working plants. Incomplete reports indicate increased activity in this group during October of about 4 per cent.

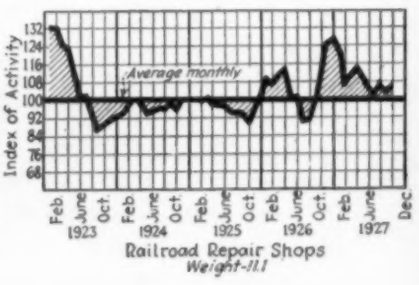
American exports of industrial machinery declined during September, according to reports of the Bureau of Foreign and Domestic Commerce. The exports in September were only valued at $13,077,000, as compared with $14,398,000 for the corresponding month of 1926. This decline was due to sharp decreases in the export of oil-well machinery. The total value of machinery exports for the first nine months of this year, however, is above the level for the same period of 1926, amounting to $133,851,000, as compared with $116,543,000 for the first nine months of last year.




"AMERICAN MACHINIST" BAROMETER OF ACTIVITY IN THE METAL WORKING INDUSTRIES
(Not adjusted for seasonal trend)
These data are compiled by "AMERICAN MACHINIST" and are based on the monthly consumption of electrical energy by about 500 large manufacturing plants in various metal working industries and scattered throughout the nation
Previous year
Average monthly activity (1923-1925)
(107.4 Sept.)
Index of Activity
1923
1924
1925
1926
1927
General Activity in the Metal Working Industries







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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Can You Get Along with Substitutes?

CAN you as a manufacturer hope to vanquish your able competitors if you undertake to carry on your manufacturing operation with less than the best equipment available? In other words, when you buy some new item in the machine line do you select the acknowledged best on the market or do you let some over-anxious salesman for an inferior machine get your order on a price concession?

You may congratulate yourself on your clever buying when you save ten, or perhaps twenty, per cent on the cost of equipment that is vital to your production plans, but you ought to know from experience with your own product and your competitor's that the man with the best product does not have to cut prices to get business. He may be foolish enough to do so at times but he does not have to, and every time he does he is taking money out of his own pocket and presenting it to his customer.

The point is that you almost certainly cannot manufacture as cheaply with substitute equipment as can your competitor who has been wise enough to pay a fair price for the best there is. Which simply means that in order to get business from him you will have to cut down somewhere else, and that somewhere else is usually in your profit margin.

Figure it out. The chances are that you will lose more on the cut you had to make to get business than you saved in the cost of the cheaper production equipment.

The Voice of Business

ONE of the most important forward steps ever taken by the Chamber of Commerce of the United States was the decision that led to the recent assemblage of its councilors, directors and committee members at West Baden. Heretofore the council has met only a day ahead of the fall meeting and its conclusions have represented the personal opinions of the individual councilors rather than the voice of all business. It is true, of course, that these individual opinions are probably no different from the opinion that would result from a referendum vote but they do not carry quite the same weight.

Through the new arrangement the councilors can discuss the items on the agenda and take back to their respective organizations a clear picture of the problems to be solved so that they can vote on them intelligently. At the annual meeting, therefore, the resolutions passed will have the solid support of the world of commerce and industry. They will be heard as the voice of business and should carry great weight with the administration and with the legislators.

Commercial Aviation Begins to Pay

WHAT seems to be the first dividend ever paid by a commercial airline company in the United States was recently announced by the Western Air Express. This company carries mail, express and passengers between Salt Lake City and Los Angeles, a distance of 600 miles, stopping at Las Vegas.

If one company, without subsidy or special advantage of any kind, can, by good management, reach the dividend paying stage in the short time this line has been in operation, others can do the same. The modern aircraft has reached the point where it must be seriously considered as a practical method of transportation. And besides developing a new business it is widening the use of machinery of all kinds.

Tax Equalization

BUSINESS is bringing to bear on Congress what forces it can muster to bring about a reduction in the corporation tax and elimination of the excise taxes on motor cars, on theater admissions and on the sales of products for future delivery. The contention is that the corporation tax discriminates in favor of the individual or partnership business as against the corporation, and that the three items subject to excise tax have been singled out for continued taxation whereas other similar items are now tax free.

Aside from the many good arguments for lowering the corporation tax and abolishing the others mentioned, the fact that there is very evident discrimination should be sufficient cause for the revision of the revenue act to do away with it. All sorts of inequalities in taxation were excusable under the stress of war times but with the war nearly a decade behind us it would seem that there had been sufficient time for adjusting them so that everyone would be treated alike.

Shop Equipment News

Warner & Swasey No. 3-A Turret Lathe with 3½-Inch Bar Capacity

PARTICULAR attention has been given to make this No. 3-A turret lathe easy to operate on large work. It has a bar capacity of 3½ in. and is made by the Warner & Swasey Company, Cleveland, Ohio. This machine should not be confused with the No. 3-A turret lathe described on page 345, Vol. 65, of the *American Machinist*. That machine is now designated as the No. 4-A model, and, while the present unit is somewhat similar to this size, including the patented covered ways, the short and narrow all-geared head construction and tooling equipment, it is nevertheless a different machine.

In Fig. 1 the lathe is shown with bar equipment, while in Fig. 2 the chucking equipment is shown similar to the regular tooling equipment of this company.

The head and bed are cast solid from a single piece of semi-steel. The casting is uniformly hard and is said to have a smooth bearing surface free from spongy metal. The ribbing and weight distribution have been arranged so that maximum stiffness is provided without bulk. The same principles have been incorporated in the entire design.

The narrow construction of the all-geared head, shown in Fig. 3, has been obtained by the use of a short hollow spindle and short gear shafts. The shafts themselves run on adjustable Timken taper roller bearings. The gears run in a bath of oil and have ample overload capacity. This type of construction assures greater rigidity in the head and the transmission of full power from the driving pulley to the spind'e. Twelve spindle speeds are provided, giving a finely divided range of surface speeds for work of large or small diameter. Forward and reverse speeds are obtained through friction cone clutches, while all other speeds are obtained through sliding gears.

Accurate alignment for both the square and hexagon turret carriages is provided by the bed ways of V shape. Patented way covers of heavy-gage pressed steel completely inclose and protect these ways under all working conditions, so that chips, grit, dust and dirt are excluded. Machines in actual operation over a period of several years have demonstrated that this method of protection is thoroughly reliable. The accuracy of the machine is thus maintained over a long period of time.

The side carriage is of the standard Warner & Swasey type, permitting the taking of combined cuts from both turrets, and assuring proper rigidity for supporting the square turret tools under heavy feeds. Sixteen longitudinal and cross-feeds are provided for the side carriage, and two overlapping ranges are available for cutting hard or soft metals, as required.

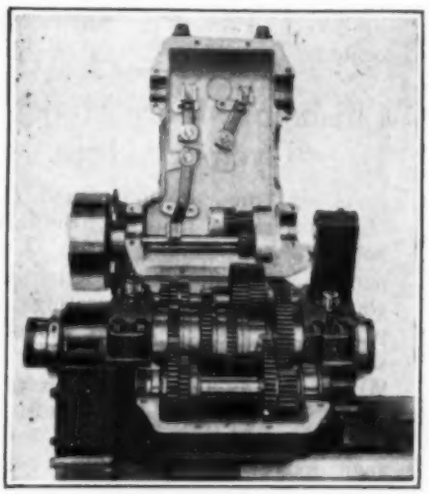
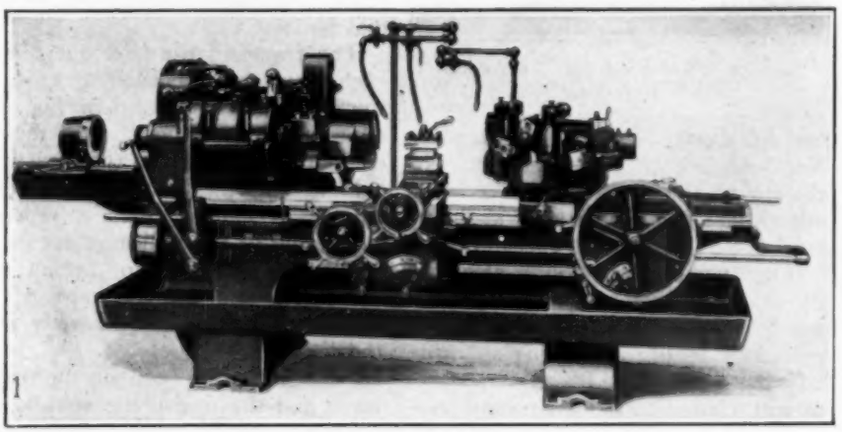


Fig. 3—Exposed view of the all-geared head

The hexagon turret carriage is provided with a circumference binder, by means of which the turret is rigidly clamped to the saddle. The tools for the hexagon turret are bolted on the inside and are centered by large projecting bosses. This construction results in a short overhang and rigid tooling. Sixteen right- and left-hand longitudinal feeds are provided for the hexagon turret. Power rapid traverse is also available to move the turret back and forth.

The gear trains for both the square and hexagon turrets are made of steel, heat-treated, and are of sufficient size to make possible extreme feeding pressures, especially for drilling. Both carriages may be fed independently of the other, thus making it possible



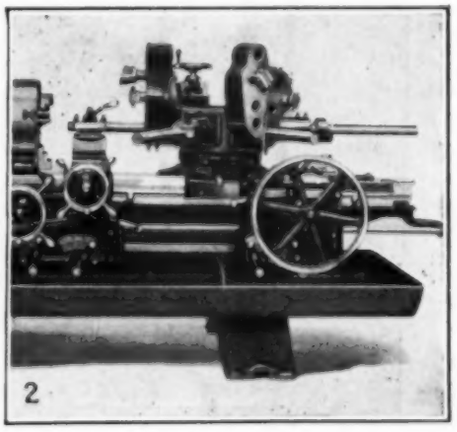


Fig. 1—Warner & Swasey No. 3-A Turret Lathe With 3½-Inch Bar Capacity
Fig. 2—Chucking equipment of the lathe

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to use the correct feed under all circumstances. Special attention has been given to facility of operation in the No. 3-A machine and all operating and feed levers are conveniently located.

Chisholm-Moore Model K "Cyclone" Hoist

As in the previous model of "Cyclone" hoist made by the Chisholm-Moore Manufacturing Company, Cleveland, Ohio, Model K is constructed on the gyrating-yoke principle. The improved model is said to have a working efficiency of 90 per cent as against 80 per cent of the older model, and a length of life without repairs considerably longer than that of the older model. After a test of 320 hours, it was found that only slight wear had taken place on the working parts.

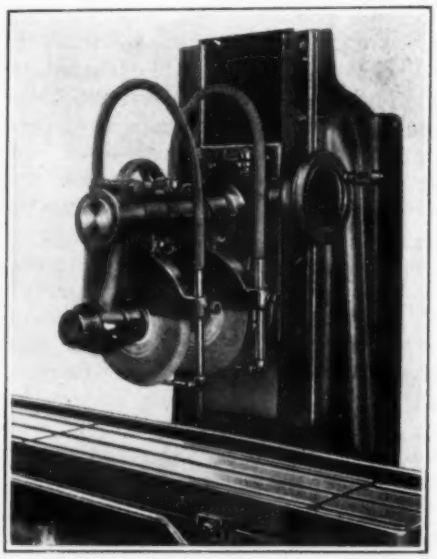
Among the improvements that made this record possible was the addition of anti-friction bearings on every rotating shaft. Eight ball bearings, four roller bearings and one Timken thrust roller bearing in the lower swivel hook, are used. In previous models the rollers in the four eccentric roller bearings were loose, and had to be carefully fitted into their cage at the time of assembling the hoist. In the Model K unit these roller bearings are built in one complete set, thus doing away entirely with the loose rollers. The lift wheel is made of a special alloy steel selected to give long life.

Chisholm-Moore Model K "Cyclone" Hoist

As with the previous Cyclone models, the entire mechanism of the hoist is inclosed in a dust-proof oil-tight housing. Under ordinary usage, the hoist needs to be packed with grease only once a year. All parts are made interchangeable. Another advantage claimed for the hoist is that it is light in weight.

Duplex Wheelhead for "Abrasive" Grinder

A special duplex grinding head with extra-long wheel spindle and an overarm support for the outboard end has been brought out by the Abrasive Machine Co., Providence R.I., for



Duplex Wheelhead for "Abrasive" Grinder

use in connection with its regular No. 3 surface grinding machine. No change in the machine is necessary other than to remove the standard head and substitute the special one.

The overarm is a round steel bar $2\frac{1}{2}$ in. in diameter, screwed permanently into the main casting of the grinding head. A swinging arm, adjustable along the bar or removable at will, clamps to the bar in any position. At the end of the arm a bronze sleeve bearing supports the outer end of the wheel spindle. This sleeve is tapered outside and provided with ring nuts by which it may be adjusted to compensate for wear.

The spindle swings wheels up to 8 in. in diameter, and its length permits a maximum spacing between wheels of 6 in. The wheels are carried upon separate sleeves, with nut and collars on each to confine them. A spacing sleeve of any desired length up to the maximum establishes the distance between the wheels. A nut on the outer end of the spindle, but inside the outboard journal, secures both wheels in the usual way.

The wheel guards are adjustable along the bar to accommodate different positions of the wheels. Each guard is made in two parts, being separated along a vertical line directly above the centerline of the wheel spindle, and is hinged above the overarm. By withdrawing a bolt either or both guards may be swung up out of the way without removing any part of them from the machine. The halves of the guards interlock, when closed, to prevent escape of water.

Ames Dial Gage for Sheet Metal

A dial gage has been placed on the market by B. C. Ames Co., Waltham, Mass., for use in mills where sheet metal is rolled to especially-close limits of thickness or in fabricating plants where the exact thickness of metal or other material employed is a matter of major importance. The design of the holding frame and the disposition of the dial thereon at an angle of 30 deg. are intended to facilitate the application of the gage and to enable the operator to take the reading without moving from his normal position.

The frame of the instrument is of such shape that it is easily grasped by the operator. The grip of his hand depresses the trigger and thereby opens the gap between the measuring spindle and the anvil to its fullest extent. When the grip is released, the spring of the indicator brings the measuring spindle into contact with the work, and the thickness of the latter can then be read directly from the dial.

The connection between the trigger lever and the measuring spindle is a floating one, so that when taking a measurement the spindle is en-

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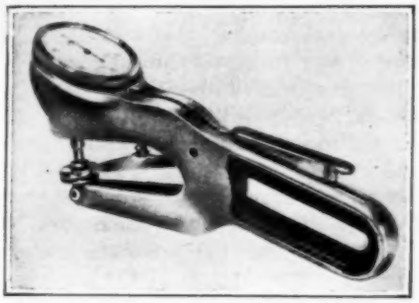


Ames Dial Gage for Sheet Metal

tirely free from the influence of the lever. A stiff coil spring actuates the lever to grip the work with considerable pressure and thereby levels it upon the anvil, so that the reading is obtained with the measuring spindle presented squarely to the material to be measured.

The gage has a capacity for material up to ¼ in. in thickness, and the dial reads directly in quarter-thousandths.

"Monarch" Ball-Bearing Bench Saw

Although the "Monarch" ball-bearing bench saw, made by the American Saw Mill Machine Company, Hackettstown, N. J., is shown in the illustration with a sub-base and motor drive, it may also be driven from an underneath countershaft. The motor regularly furnished is rated at ½ hp. for use on single-phase, 110- or 220-volt, 60-cycle circuits. Motors for other standard currents can be furnished on special order.

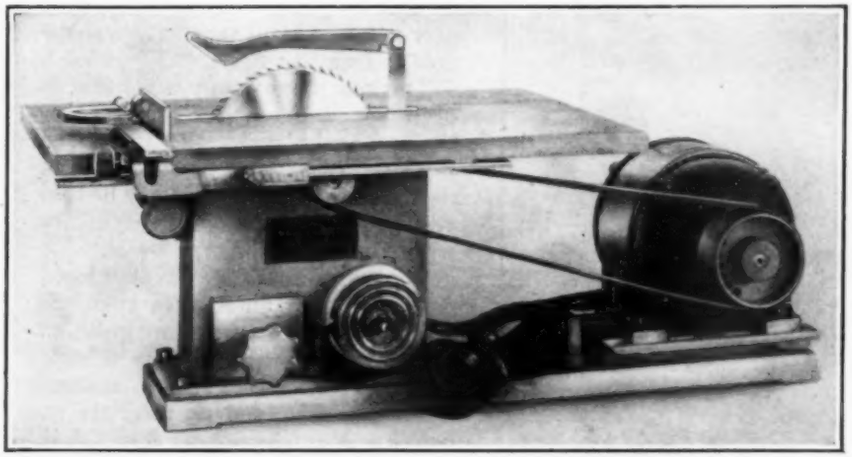
The table is cast solid and measures 18x24 in. It tilts to any angle up to 45 deg., and is operated by means of a convenient handwheel at the side of the pedestal. The saw is raised and lowered by means of another handwheel, also located at the side of the pedestal. The tilting device operates through a worm gear and quadrant having cut teeth, while the saw-raising device operates through bevel gears and a screw. The table has a rise of 2¼ in. and the saw projects through it 2¼ in. at its highest point. The saw regularly furnished is a combination rip and cut-off saw, 8 in. in diameter.

The table is provided with a combination rip and cut-off gage. When used as a ripping gage the slide head is locked, and the fence is swung around to the 90-deg. position and locked. There is adjustment for accurate alignment with the saw. When used as a cut-off gage, the slide head is released and the gage moves on the table, being guided by a steel bar to which the slide head is gibbed. The fence may be set at zero for square work or at any angle desired for miter work, the quadrant being graduated in degrees. The ripping gage opens from the saw 9½ in., and a graduated bar indicates the distance from the saw. When the cut-off gage is drawn back to its extreme position, the distance from the face of the fence to the edge of the saw is 7 inches.

An aluminum guard and steel splitter are furnished with each machine. The saw mandrel is mounted in ball bearings. It takes a saw with a ¾-in. hole.

The machine proper is attached to a sub-base which also carries the electric motor. The motor is mounted on rails and has considerable adjustment for varying belt lengths. The belt tension is adjusted through a screw.

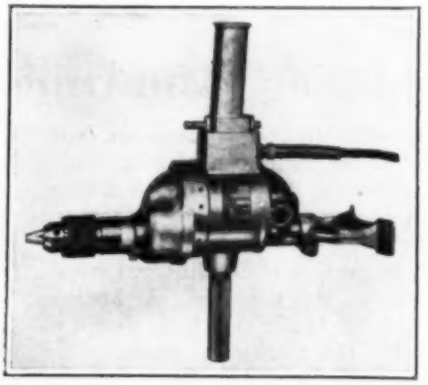
The height of the machine with sub-base from the top of the table is 12¼ in., while the height without the sub-base is 11 in. The machine base measures 6x11 in., while the sub-base measures 7x29 in. The shipping weight of the unit with sub-base and motor is 240 pounds.



"Monarch" Ball-Bearing Bench Saw

Standard Electrical Tool Co. ½-Inch Special Electric Drill

Announcement is made by the Standard Electrical Tool Co., Cincinnati, Ohio, of a special electric drill that has a capacity for drilling holes up to ½ in. in diameter in steel, and up to 1 in. in diameter in hardwood. The motor used is a universal type made by the General Electric Co., and will operate on either direct or alternating current of 60 cycles or less. It is an air-cooled type.



Standard Electrical Tool Co. ½-Inch Special Electric Drill

The gears are made of chrome-nickel steel, heat-treated, and they run in grease. The shafts are mounted on SKF ball bearings. The housing of the motor is made entirely of aluminum to make it light in weight. The complete weight of the drill is 14 pounds.

"Fuzon" No. 300 Motor-Driven Arc Welder

A recent addition to the line of "Fuzon" arc welders, made by the Fusion Welding Corporation, 103d St. and Torrence Ave., Chicago, Ill., is a d.c. machine, No. 300, operated by a three-phase a.c. motor on either

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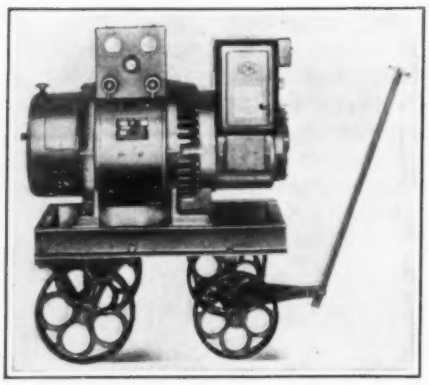

"Fuzon" No. 300 Motor-Driven Arc Welder

220 or 440 volts. Both the welding motor and generator are mounted on the same shaft, making a two-bearing unit. The chief characteristic claimed for the unit is its flexible arc. The machine is said to respond instantly to changes in arc length so that it is possible to instantly increase or decrease the arc length by half an inch without extinguishing it.

The No. 300 welder has no external stabilizer, no field rheostat and no separate exciter. The welding current is controlled by a simple brush-shifting device, giving the unit a wide range of operation. The current can be varied from 50 to 300 amp., and over this range the arc is equally flexible and stable. This is due to the fact that by shifting the brushes not only the current going to the operator is controlled, but also the volt-ampere characteristic of the machine is altered in such a manner that the most suitable characteristic is obtained at each current to which the machine is set. Because of this adaptability, metals from the thinnest to the thickest can be welded with equal facility by merely setting the current at the desired amperage.

Melling "Mill-Drill-Matic" Machines

FOUR distinct operations of straddle milling, or facing, drilling, removing the burr from a drilling operation, and reaming to size where the drill diameter does not exceed $\frac{3}{8}$ in. in steel, can be performed simultaneously on the No. 3 Melling "Mill-Drill-Matic" machine shown in Fig. 1. The machine is made by the Ampco Twist Drill Co., Jackson, Mich. This work can be performed at one setting by a single operator and at a high rate of production.

The machine is composed of a work dial that automatically indexes from station to station and locks in position. The locking mechanism makes the dial as rigid as the bed itself and assures against vibration from the milling cutters. The mechanism above the dial is comprised of two vertical spindles, one for drilling and the other for reaming, and two milling units, one for rough milling and the other for finish milling.

In the first position of the dial, rough milling is performed and the milling cutters automatically advance and retract, removing all stock except a few thousandths on each surface. In this way flat surfaces are provided for the support of the piece and the starting of the drill. The next position is that of drilling. At this point the work is indexed over a hardened rigid support which prevents shifting of the piece in the holder from the pressure of the drill. The third position is that of finish milling where the remaining material is removed from the piece together with the burr caused from the drilling operation. Finally, the work is placed over a second rigid support where the hole is reamed to size.

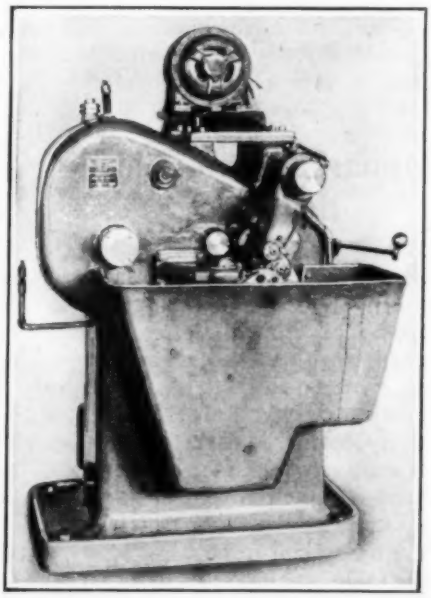

Fig. 2—Melling No. 1 Semi-Automatic "Mill-Drill-Matic" Machine

This machine is fully automatic in operation, and requires that the operator simply insert the unfinished work and remove the finished. It can also be equipped so that it may be conveniently stopped or started at the will of the operator.

The No. 3 machine was developed particularly for automotive yoke end production, but may be employed on any work where the quantity is sufficient and where straddle milling, drilling, burring and reaming are required. A production of 850 S.A.E. standard $\frac{1}{4}$-in. yoke ends per hour is attainable.

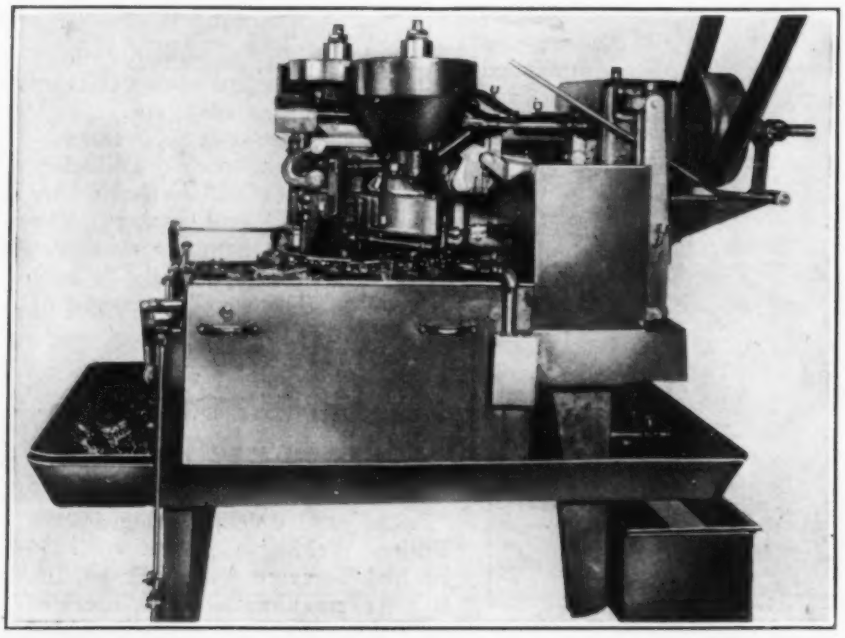

Fig. 1—Melling No. 3 Semi-Automatic "Mill-Drill-Matic" Machine

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The No. 1 machine accomplishes the machining of similar parts in smaller quantities with the same degree of accuracy and efficiency as the Mill-Drill-Matic No. 3. It will straddle mill or face, drill, remove the burr from drilling operation, and ream to size, where the drill diameter does not exceed $\frac{5}{8}$ in. in steel. The operations are performed in sequence, however, instead of simultaneously.

The design of the machine is simple, as can be seen from Fig. 2. All wearing surfaces are cylindrical and there are no ways or flat surfaces. Lubrication is fully automatic and all working parts are inclosed in an oil-tight case with an oil level gage glass on the outside.

With the exception that the operator must put in the unfinished and remove the finished work, the functions of the machine are entirely automatic. It will perform its operation in sequence, moving the work from one operation to the next through its entire cycle, and then stop. Since the time required for unloading and loading is only a small fraction of the total time of the work cycle, one operator is easily enabled to run a number of machines on a variety of parts.

The machine may also be equipped to handle a number of approximately similar parts. The time required to change the work-holding fixture and cutter set-up from one part to another is approximately twenty to thirty minutes. This feature makes the machine adaptable to short-run work without the loss of efficiency. The No. 3 machine weighs 5,500 lb. and occupies a floor space 3 ft. 11 in. x 8 ft. The No. 1 machine weighs 4,800 lb. and occupies a floor space of 3 ft. 9 in. by 5 ft. 6 inches.

Micro Model IG Internal Radius Grinder for Special Dies

ACCURATE and smooth radii on drawing dies can be ground on the Model IG internal radius grinder shown in the accompanying illustration. This machine is made by the Micro Machine Company, Bettendorf, Iowa, and is designed to replace hand grinding or tooling. The drawing die shown mounted in the machine in the illustration is for use in drawing seamless tubing. Radii of sheet metal drawing dies can also be ground to advantage on this machine. The range of the Model IG grinder permits radii from 1 to 10 in. to be ground in holes varying from 10 to 25 in. in diameter, and up to 6 in. in depth.

The grinding head and driving motor for the spindle are mounted on a circular table, which can be rotated 65 deg. The heavily-ribbed table pivots on a pin fitted with a roller bearing, and is driven through a segment gear. The table is provided with reversing dogs and quick start and stop controls. To facilitate setting up, the table has both hand and rapid power feed, in addition to five feeds for various depths of cut. The slide-ways are lubricated by a force-feed oil circulating system, with proper facilities for filtering the oil.

The chuck headstock spindle is mounted on taper roller bearings, spaced 33 in. between centers with a take-up nut to compensate for wear. The spindle is mounted on an intermediate slide to obtain adjustment for various radii. To maintain correct work travel regardless of the diameter of work, the chuck speed is variable and may be quickly changed by means of a graduated dial located on the operative side of the machine. This dial controls the position of the belt on the taper cone at the rear of the machine. By setting the headstock speed to suit the diameter of work a maximum stock removal is possible in both large as well as small holes.

The grinding spindle is mounted on ball bearings contained in dust proof housings and running in oil baths. The spindle itself is balanced. For feeding the grinding wheel to the work, longitudinal and transverse movement is provided by an intermediate slide. The grinding wheel has a removable guard, and an assortment of spindle pulleys are furnished to give correct peripheral speed.

The table reverse gear drive can be controlled either by hand or automatically, from either operating position. It also is lubricated with a force-feed oil system. Both slides have gibs to insure positive alignment and are provided with locking means to eliminate any danger of movement during the grinding operation.

A diamond and a diamond holder bracket are conveniently mounted on the machine and are provided with adjustment for dressing various sizes of wheels. The diamond holder proper also has a screw adjustment for feeding the diamond.

A 3-hp. motor operating at 1,750 r.p.m. is required to drive the grinding wheel spindle. The headstock drive motor is rated at 2 hp. at 1,150

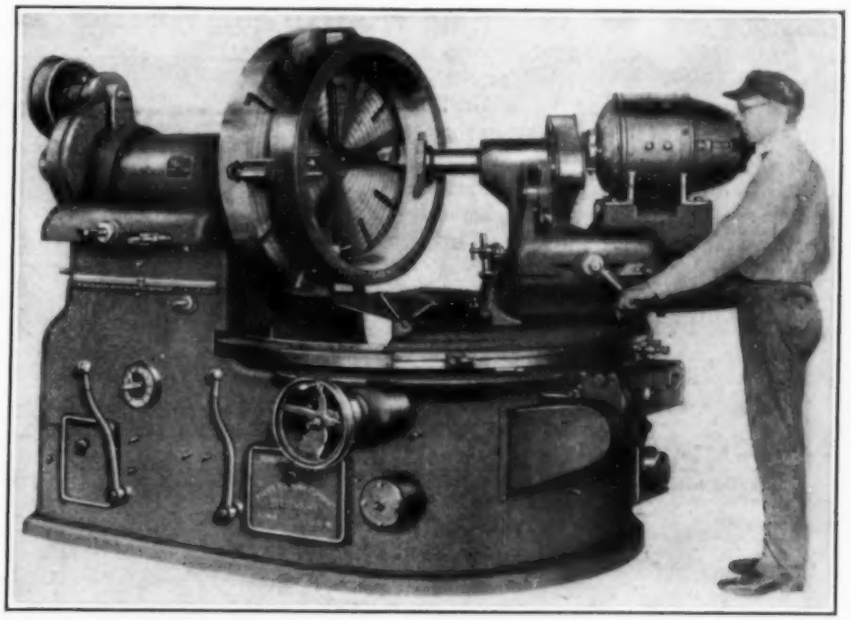

Fig. 1—Front view of the Micro Model IG Internal Radius Grinder for Special Die Work

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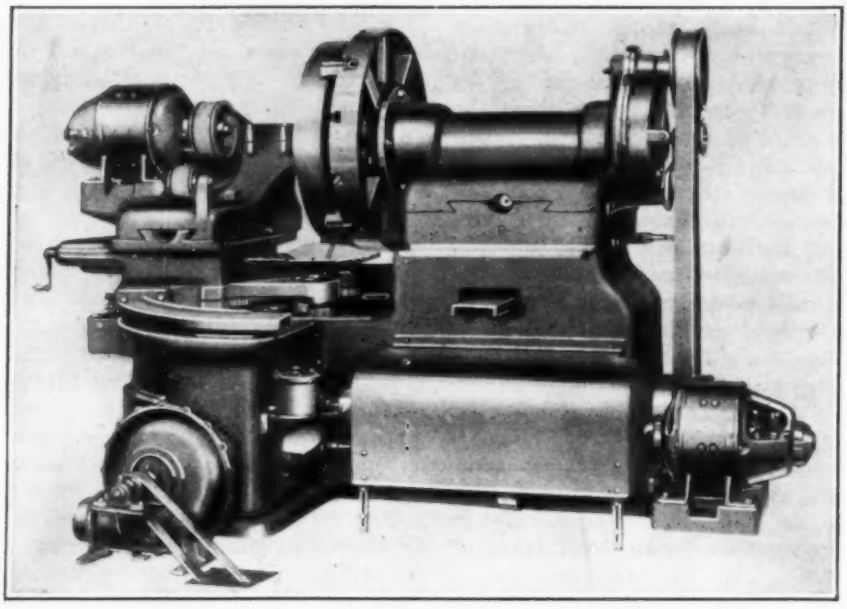


Fig. 2—Rear view of the Micro Model 1G Internal Radius Grinder

r.p.m., and the exhaust fan requires a 2-hp. motor and 1,750 r.p.m. The floor space required for the machine is 12 ft.x8 ft., and its height is 6 ft. The height from the floor to the center of the grinding spindle is 4 ft. 7 in. The net weight of the machine with standard equipment is 12,700 lb., approximately.

"Wizard" Friction Safety Tap Holder

This "Wizard" friction safety tap holder is designed to prevent tap breakage on machine tapping. It is made by the McCrosky Tool Corporation, Meadville, Pa. The holder fits directly into the spindle of a drill press, the turret of a turret lathe, the tailstock of an engine lathe, or the spindle of an electric drill. It is compact in size and reduces the overhand below the spindle to a minimum. The holder enables the operator to drive the tap to its full capacity all the time. As soon as this point is passed, or the tap meets an obstruction or hits the bottom of a blind hole, sliding takes place within the tap, which then stops.

In Fig. 1 the tap is shown. In Fig. 2 a disassembled view is given to show its construction. There are only five parts including the bushing that holds the tap. The plug that receives the bushing is tapered both ways. Each taper fits into a fiber-lined cup, and a differential nut with knurled collar draws the lower cup towards the upper one to increase the friction. The ratio of the threads in the collar is such that a sensitive and positive adjustment of friction is provided.

The tap is driven by the square end.

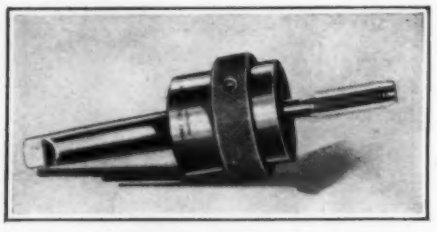


Fig. 1—"Wizard" Friction Safety Tap Holder

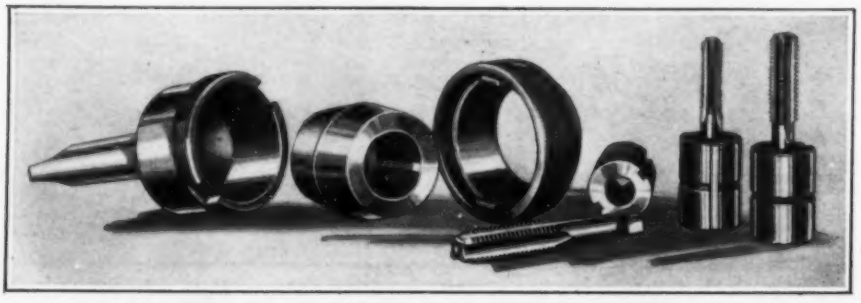


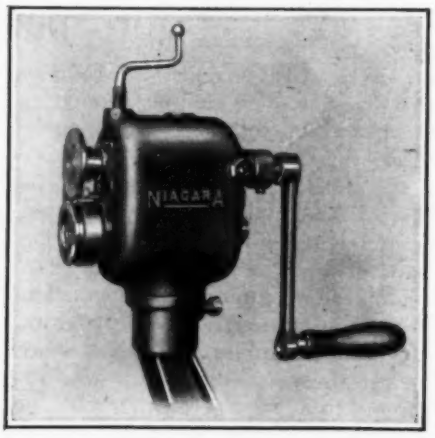
Fig. 2—Disassembled view of the tap showing its construction

The bushing is driven by two keys and floats in the holder. It is held in place by a ball and spring retainer. Should the spindle be raised too rapidly in backing out the tap, the bushing will be drawn out of the holder without injury to the tap.

The holder and bushing are made in three different sizes. The complete range will take care of hand taps ranging from $\frac{5}{16}$ to $1\frac{1}{4}$ in., and pipe taps from $\frac{1}{8}$ to 1 in. Special bushings for taps with special shanks and for setting nuts can also be furnished.

Niagara Turning, Wiring, and Burring Machine for Sheet Metal

A combination bench machine for use in sheet metal shops was recently developed by the Niagara Machine Tool Works, Buffalo, N. Y. It can be furnished as a single-purpose machine or with a full set of rolls. In the illustration, the face-turning rolls are shown mounted in the unit. It can also be supplied with rolls for burring or wiring the faces of sheet metal disks or rolls. The maximum size wire accommodated is $\frac{5}{16}$ in. The maximum thickness of stock handled is 22 gage.



Niagara Combination Bench Machine for Turning, Wiring, and Burring Sheet Metal

The frame is made of one piece and is extra heavy for rigidity and strength. The bearings for the lower shaft are located in the solid metal of the frame. The upper shaft is movable at the front and is pivoted at the back. The connection gears are machine cut and are completely inclosed.

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The turning, wiring or burring roll faces are made of high-grade steel, hardened and polished. They are readily removable from the shafts which are mounted $2\frac{1}{8}$ in. between centers. The gage is also made of polished steel and has a fine screw adjustment with locking nut. A treadle attachment can also be furnished in place of the crank screw for the upper shaft. The unit weighs about 38 pounds.

"Universal" Magazine-Feed Screwdriver

MACHINE screws ranging in size from No. 4 to $\frac{1}{4}$ in. and from $\frac{1}{4}$ to $1\frac{1}{4}$ in. in length, can be driven in the Model B-2 "Universal" screwdriver with magazine feed, made by the Detroit Power Screwdriver Co., 419 Riopelle St., Detroit, Mich. With other models, wood screws and self-tapping screws can be driven in a similar manner. In Fig. 1 the complete unit is shown, while in Fig. 2 a cut-out section of the machine indicates the pick-up mechanism.

This pick-up mechanism is similar in form and in action to the palm of a hand. It dips into the hopper at each revolution and lifts a handful of screws and palms them into position for delivery. The screws so carried are lifted free and clear of the mass of screws in the hopper before being delivered to the stationary storage track. It is claimed that there can be no interference from undelivered screws, or screws having screw slot burrs, eccentric or imperfect heads. Also, it is not possible to feed work to the machine so fast that this device cannot keep up a continuous delivery of screws.

For the driving of machine screws the recommended spindle speed ranges from 1,200 to 1,750 r.p.m. The outstanding feature of the unit is the friction mechanism, by means of which this high speed is made possible. As it seeks the slot of the screw, the bit slowly rotates by a slight dragging action. Once the slot is located the screw is driven home, when the pedal is depressed. The bit is stationary as it leaves the slot after the screw is driven. Hence it cannot mar the head of the screw, regardless of the speed at which the spindle is operated.

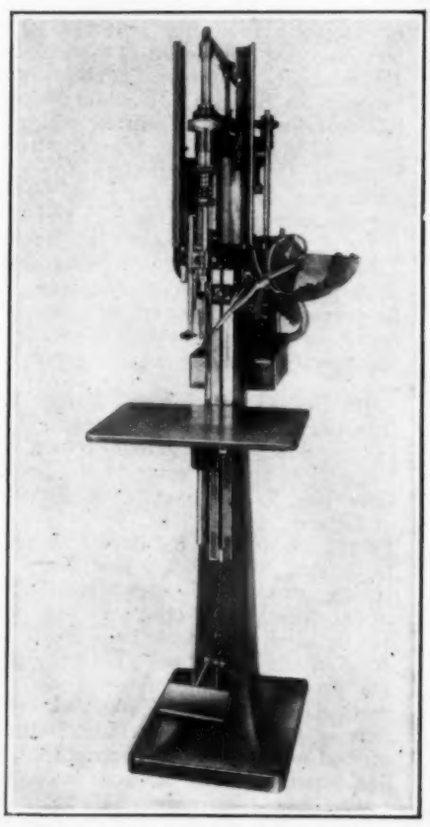


Fig. 1—"Universal" Magazine-Feed Screwdriver

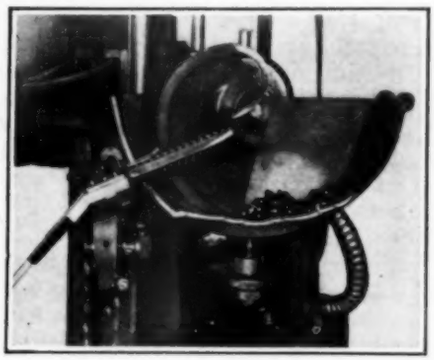


Fig. 2—The screw pick-up mechanism

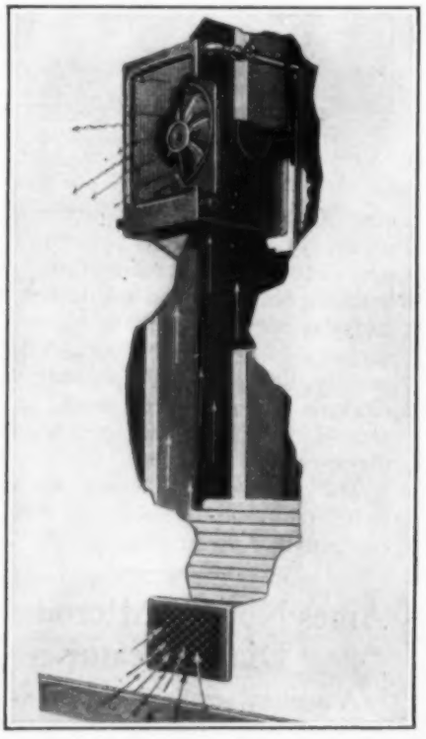
The tension at which screws may be set is under precise control and is always independent of varying pressures applied at the pedal. This tension is not perceptibly affected by momentum, since only the light hollow lower spindle is influenced by momentum. Due also to the sensitiveness of the control the threads are not damaged. This fact is of particular advantage with threads in thin brass stampings.

The holding fingers, assembled with the spindle, carry the screw down through the full stroke (maximum $4\frac{1}{2}$ in.) and release their hold on the screw usually after a thread or two have been engaged. As a result, with this machine screws can be driven to the bottom of a tube or cup as small as 1 in. in diameter.

"Venturafin" No. 2 Unit Heater

This No. 2 "Venturafin" unit heater made by the American Blower Co., Detroit, Mich., is particularly adapted for small areas for which the larger units cannot be used on account of their excess heating capacity. The No. 2 unit is recommended for offices, small store rooms, garages and small shops. On page 525, Vol. 60, of the *American Machinist*, the larger unit was described.

This smaller unit extends the advantages and economy of the indirect method of heating to smaller rooms and buildings. The unit measures $22\frac{3}{4}$ in. high, $14\frac{3}{8}$ in. wide and $12\frac{7}{8}$ in. deep. It delivers 450 to 900 cu.ft. of heated air per min., representing a heating capacity equal to 125 to 200 sq.ft. of direct radiation. Like the larger unit, it consists of a series of steam pipes through which air is



"Venturafin" No. 2 Unit Heater

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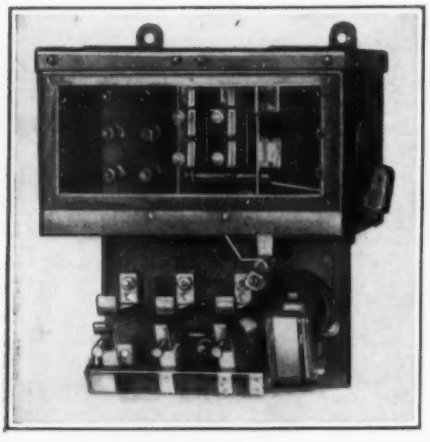
blown. The cold air is drawn from a point near the floor where it naturally collects.

The illustration shows one of these units installed in a partition wall. Air is taken through the grill near the floor. Other methods of installation are adapted as conditions require.

Westinghouse Dust-Tight and Oil-Immersed "Linestarters"

For special applications, the Westinghouse Electric & Manufacturing Company., East Pittsburgh, Pa., is building two modifications of its standard equipment of "Linestarters." One of these has special provision for excluding dust, all possible openings being rendered dust tight. Another modification of the Line-



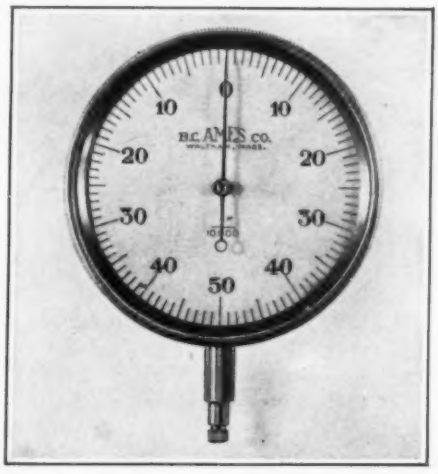
Westinghouse Oil-Immersed "Linestarter"

starter has all parts in which sparks or arcing might occur immersed in oil. The main current-carrying and breaking contacts are oil immersed, and the operating coil is below the surface, as is the interlock. Consequently, under normal operating conditions, no explosive gases in or around the starter can be ignited by the operation of it.

The oil-immersed Linestarter, with cover removed, is shown in the accompanying illustration.

Ames No. 100 Micrometer Dial Indicator

A micrometer dial indicator, designated as No. 100, is now being manufactured by B. C. Ames Company, Waltham, Mass. It has a dial 2½ in.



Ames No. 100 Micrometer Dial Indicator

in diameter and is graduated in increments of 0.0001 in. It reads plus or minus from zero.

The measuring spindle has a travel of $\frac{1}{10}$ in., causing the pointer to make ten full revolutions over the dial. Because of the unusually large amplification through the gear train and the consequent wide spacing of the divisions on the dial it is possible to estimate fractions of "tenths" without difficulty.

Though the instrument shown has a plain non-adjustable dial, it is also made with a second, or counting, hand to indicate the number of turns made by the large pointer, and with a movable bezel by which the zero may be brought under the pointer in any position of the latter.

Trade Catalogs

COUPLINGS, FLEXIBLE. The Ajax Flexible Coupling Co., Westfield, New York, has recently issued a new general bulletin, completely describing the Ajax industrial shock absorber. This book is complete with illustrations and data, and sets forth the advantages of the Ajax rubber bumper coupling.

CRANES, LOCOMOTIVE-TYPE, ELECTRIC. The Baker-Raulang Co., Cleveland, Ohio, describes in Bulletin No. 32 its electric locomotive-type crane. The standard and special construction features are pointed out, and charts are used to indicate the various capacities at different positions of the boom. Ten important design features are also stressed. Complete specifications are given. The bulletin contains eight pages and is well illustrated.

DIEHEADS. The Geometric Tool Co., New Haven, Conn., has issued a booklet describing its new line of style K self-opening dieheads. This includes style KD, K and KH. The construction and operation of each is explained in considerable detail with the aid of photographs, showing both assembled and disassembled views. Complete specifications are also given. Several pages are also devoted to describing the manufacture of the style K chaser. The publication contains 32 5x7½-in. pages.

GEAR GRINDING MACHINES. The Grinding Machine Co., Detroit, Mich., has prepared an illustrated circular on its equipment. The machines made by this company employ the formed wheel method. The type G-G-10 gear grinding machine is described and its operation is discussed on typical work. Other gear grinding and testing machines made by this company are also described and illustrated.

GENERAL-ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has issued a number of leaflets perforated for insertion in a loose leaf binder. Bulletin GEA-118 is devoted to push-button stations for use in the control circuits of all types of magnetic controllers. Bulletin 152A is devoted to type AW auxiliary welding resistors to operate with constant-potential generators for metallic welding. Bulletin 788 treats of general-purpose, squirrel-cage motors, while Bulletin 813 treats of magnetic reversing switches. Battery-charging equipment is discussed in Bulletin 817, pressure and vacuum switches in Bulletin 821, while Bulletin 822 describes the ball-bearing construction used in a.c. and d.c. general-purpose motors. Duplex controllers for constant-speed d.c. motors for pump service are discussed in Bulletin 826 and centrifugal air compressors in Bulletin 233A. All of these publications are well illustrated with both photographs and line drawings. The construction and operation of each device is explained and specifications are usually given.

JIG BORERS. The R. Y. Ferner Co., Investment Building, Washington, D. C., has available for distribution two catalogs on equipment made by the Société Genevoise D'Instruments de Physique of Geneva, Switzerland, for which the Ferner Company is the American agent. In catalog No. 453, the new No. 7 jig boring machine is described. This model differs from others in that work can be handled in three co-ordinates instead of the usual two. Three spindles are provided, two horizontal and one vertical. The construction and operation of the machine is completely described with the aid of photographs and line drawings. The publication contains twelve 8½x11-in. pages. Circular No. 450 describes the No. 3 jig boring machine. The treatment is somewhat similar to that of the No. 7 machine.

NEWS OF THE WEEK

New England Flood Injures Industrial Plants

Damages to machinery and shop equipment surprisingly low considering the number of important plants in the danger zone

NEWSPAPERS all over the country in the past two weeks have told the story of the storm and flood in New England. Whole communities have been buried under water and untold damage has been done to roads, dwellings, farm lands, and railroad property.

But few instances have been mentioned in the published accounts where manufacturing plants in this industry have recorded specific losses. In order to give its readers first-hand, authentic information about these plants, the *American Machinist* communicated with a number of the prominent machinery manufacturers whose plants were in the path of the flood waters. The replies are given here in brief.

The Fellows Gear Shaper Co., at Springfield, Vt., states that its total damage was the collapse of a retaining wall and the flooding of the lower assembly floor of the cutter department. Production was resumed as soon as the water subsided. Total damage was about $15,000.

W. B. McSkimmon, president of the Union Twist Drill Co., at Athol, Mass., reports that his plant at Derby Line, Vt., was slightly damaged, but that manufacturing was resumed in a few days. The caving in of a wall allowed water to get into one of the buildings.

F. McKenzie, secretary of the Hendey Machine Co., Torrington, Conn., writes that his plant suffered virtually no loss from the flood.

W. T. Secor, superintendent of the plant of the Waterbury Farrel Foundry and Machine Co., at Waterbury, Conn., writes that the damage done to that plant will amount to about $3,000. The water backed in from the street, flooding the cut-off department, the foundry, screw machines, receiving and supply department and the basement of the main office. Motors were short circuited and floors were badly damaged. It was several days before operations could be resumed in the production departments.

Although the water reached flood height in the Millers River, the plant of the Millers Falls Co., at Millers Falls, Mass., was not damaged.

The mills of the American Brass Co., on the Naugatuck River, near Waterbury, Conn., were in the line of the storm but no machinery was damaged or disabled.

The shops of the Farrel-Birmingham Co., Inc., successors to the Farrel Foundry and Machine Co., at Ansonia, Conn., were not touched by the flood waters, although the Naugatuck River overflowed into the property.

The E. J. Manville Machine Co., Waterbury, Conn., reports that its plant was not affected by the floods, as the water did not reach it.

Joseph C. Regan, president of the E. Horton & Son Co., Windsor Locks, Conn., writes that his shops, being located above the river and canal level, were not reached by the rising waters. Considerable work had to be done, however, in reinforcing the canal walls which held the strain of the flood.

The American Bosch Magneto Corporation at Springfield, Mass., reports no damage sustained to its machinery or equipment.

At the Wiley & Russell plant of the Greenfield Tap and Die Corporation, at Greenfield, Mass., the water rose a foot above the second floor, but the most valuable machinery was removed before the water reached it.

Gilbert & Barker's plant at West Springfield was under 20 in. of water and operations were suspended for a week.

The new shops of the Perkins Machine and Gear Co., at West Springfield, Mass., were flooded and production was stopped temporarily.

The basements and part of the machine shops of the Moore Drop Forging Co., in Springfield, Mass., were flooded, but damages were slight.

Considerable stock was destroyed by water in the plant of the Blake Manufacturing Co., producers of metal stampings and flashlights.

The Windsor, Vt., plant of the National Acme Co., sustained about $50,000 property and production loss, according to Guy Hubbard, representative. The flood came unexpectedly and in a short time reached a height of 4 ft. above all previous records. The basement and first floor of the shops were flooded and many shop records were ruined. No damage was done to the offices. Production was suspended for almost a week and it was expected that normal operations would be resumed in another week.

The Pratt & Whitney plant on the Park River, near Hartford, escaped unscathed. The city proper was flooded and the company's aviation field was also under water, but the Connecticut River carried away most of the flood waters and the main plants were not touched.

The Cone Automatic Machine Co., Inc., with a plant at Windsor, Vt., did not suffer as severely as some other firms in the neighborhood. The water rose 2 ft. in the shops on the morning of the day of the flood, but by night it had subsided and the shops were being cleaned out. The loss was about $3,000—mostly for labor—according to F. L. Cone.

The Putnam Machine Works, of Manning, Maxwell & Moore, Inc., at Fitchburg, Mass., was not damaged by the flood in that district.

R. W. Daniels, treasurer of the Bausch Machine Tool Co., at Springfield, Mass., reports no damage to that company's plants, which were not in the district reached by the flood.

The Bristol Co., at Waterbury, Conn., writes that the water did not reach its shops and no loss was incurred. Some inconvenience was experienced from transit delays.

Henry S. Beal, assistant general manager of the Jones & Lamson Machine Co., at Springfield, Vt., reports that the water in that city reached a height close to the record of 1869. His plant might have escaped serious damage had it not been for the fact that the bridge between the main plant and the foundry was swept away and lodged in such a way as to divert the waters directly into the plant. The floors were from 3 to 6 in. under water, but files and blueprints were not touched. The foundry loss was considerable as many patterns and records were ruined. The shops are now operating on regular schedule.

J. Lovell Johnson, president of the Iver Johnson Arms and Cycle Works, at Fitchburg, Mass., reports that the plant of that company was not at all damaged by the flood. The Nashua River, which runs near the plant, became swollen but did not overflow enough to reach the shops.

Auto Exports Gained

The export value of all automotive products during the month of September totaled $29,129,619, an increase of less than $1,000,000 over September of 1926, according to the Department of Commerce. However, the monthly average of automotive exports maintains a high figure of $35,202,834.

U. S. Exports to Latin America Exceed Those of England, Germany and France

One-fifth of our total exports go South of Rio Grande

WITH five billion dollars of American investments in Latin America, with a network of new steamship and cable communications, with a well directed trade promotion campaign on the part of American exporters, and, especially with the fundamental asset of the Panama Canal, our trade with the twenty countries of Latin America has not merely held its own since the war but is steadily increasing from year to year at the expense of our competitors. In spite of a widespread belief that we are "slipping" in Latin America, the figures show that we are selling the twenty republics south of us a hundred million dollars' worth of goods a year more than England, Germany and France combined; and that practically one-fifth of our entire export trade now finds a market between the Rio Grande and Cape Horn.

The United States is now the first supplier of goods to every country in Latin America except Paraguay; more than two-thirds or $600,000,000 of our exports southward are the finished products of American manufacturers. This is the synopsis of a report issued last week by O. K. Davis, secretary of the National Foreign Trade Council.

For the whole of Latin America, including Central America and the West Indies, we have increased our share in the imports of these twenty republics between 1913 and 1925 from one of about 25 per cent to one of 37½ per cent. And for Central America alone our share as a supplier has grown from one of 40 per cent to one of over 66 per cent during the same period.

On the other hand, our chief competitors — England, Germany and France — have seen their proportion of Latin America's imports as a whole decrease from more than one of 50 per cent in 1913 to one of 33 per cent in 1925. As a matter of fact, we are supplying Latin America with substantially more goods than our three competitors put together, the figures being $914,000,000 as against $804,000,000 for the latest comparative tables, those of 1925; while in Central America alone they supplied in 1925 but 16 per cent of the imports against our 66 per cent. "Our competitors in Latin America are keen and alert," says Mr. Davis, "but it is notable that it is they who are copying our methods today. We may not be making the most of our opportunities, but it is they who are slipping, not we."

One reason for this increase of United States trade that is not far to seek is the great development of our investments. From about 100 millions before the war they have grown to over a billion and a half dollars in South America in the present year. According to the latest figures of the Bureau of Foreign and Domestic Commerce, our trade in Latin America rests on a solid triangle of investments wherein a billion and a half dollars is invested in Cuba, another billion and a half in Mexico and Central America, and more than a billion and a half in South America, making a total of between four and a half and five billion dollars of American money which we have now invested to our account throughout Latin America. Since 1919 flotations of government and business loans in Latin America in this country have amounted to about $200,000,000 a year, and have approximated the very substantial sum of $2,000,000,000 of new post-war investment.

"Another contributing cause," reasons Mr. Davis, "is the improvement of our shipping lines, particularly to South America. United States vessels operate to all points of the continent offering faster service than British vessels—eighteen days from New York to Buenos Aires and twenty days from New York to Valparaiso, with corresponding fast time to other South American ports on both coasts. The merchant marine of the United States has risen to the emergency and matches and exceeds its competitors in passenger and freight accommodations and in alterness in getting and holding business. In the essential matters which make for trade, it must be acknowledged by those who question our achievements without any knowledge of them, that we are gaining steadily from year to year while our rivals are losing ground."

But it is in the most intensely competitive markets in South America, particularly in the Argentine, as well as in Brazil and Chile, where the true test comes. In all these three countries the United States was considerably behind both England and Germany as an exporting nation in 1913. It is a remarkable symptom of our growth that in each one of these countries, whose combined trade amounts to one-third of that of the South American continent, we are now first, and are increasing rather than relinquishing our lead.

In the northerly South American countries our margin of precedence as an exporter is even more marked. In Venezuela, Colombia, Ecuador and Peru our proportion of the imports of these countries ranged from 39 per cent in the case of Peru up to 54 per cent in the case of Colombia for the year 1925, aggregating for the group of countries more than that of our two leading competitors combined.

"Our growth of trade in these northern countries of South America is of primary importance, for there is no contiguous group of countries in the world that has more substantially increased its foreign trade since 1913 than the five republics of Central America and six of northern South America, with Mexico, Cuba, Haiti and Santo Domingo. The fifteen countries in this progressive trade belt have increased their exports from about $505,000,000 in 1913 to about $1,125,000,000 in 1925, a growth of almost 125 per cent.

The United States now maintains trade commissioners or commercial attaches at Rio de Janeiro and Sao Paulo, Brazil; Buenos Aires in Argentina; Bogota in Colombia; Caracas in Venezuela; Havana, Cuba; Mexico City; Montevideo; Uruguay; and Santiago, Chile.

"Aircat" Plane Motor in Production

After many weeks of research and experimentation, officials of the Detroit Aircraft Engine Corporation announced last week a program of production and development. The corporation is the successor to the Detroit Aircraft Engine Works, a syndicate formed by Capt. Eddie Rickenbacker and others.

Of greatest interest at the moment, according to George W. Yeoman, chairman of the board of directors of the new corporation, is the production program. Mr. Yeoman was for 16 years an engineer with Continental Motors.

The "Aircat," which this company is building, is a light airplane motor designed to meet the needs of airplane builders who cater to private owners and to the operators of taxi lines and light delivery services. The engine is made in three sizes, the 35-hp. three-cylinder type, the 60-80 hp. five-cylinder type, and the 100-110-hp. seven-cylinder type. One of the features of this motor is the fact that all parts are interchangeable. Another important feature is the method of assembling. The crankshaft with the connecting rod and all other reciprocating parts are assembled in one unit and then placed in the crankcase.

All of the machinery in the plant is designed to produce parts for all three types of motor and in this way many economies are expected. This month the company will try out its tools, dies and equipment, producing about 20 motors. From then on, one motor a day will be turned out and this number will be increased.

Many features of automobile motor construction have been embodied in the "Aircat." Chief of these features is the cast-iron cylinder with aluminum piston. All types of the "Aircat" have been in actual flying service for many months.

Glenn D. Angle, designer of the engine, spent more than seven years in government aviation. The other officers of the new corporation are; G. Oliver Black, president; Fred J. Armstrong, vice-president; James B. Kirk, secretary and treasurer. Mr. Black is president of the Peninsular Metal Products Company.

Automobile Equipment Exhibited at Chicago

What the well-dressed automobile will wear in 1928 in the form of accessories and special equipment, and what an up-to-the-minute garage will be able to install in the form of tools and shop equipment, was shown at the ninth annual exposition of the Automotive Equipment Association, held at the Coliseum, in Chicago, Nov. 7 to 12. Over 250 exhibits were on display.

The exposition was laid out in streets and shops, each street being named after some Chicago thoroughfare, a new and unique feature of automotive expositions and one designed by William M. Webster, who is commissioner of the association.

The convention program opened with an address on "Greater Market Development," by Harry G. Moock.

This was followed by the reports of divisional managers and by an open discussion of conditions both at the present time and for the near future in the automobile accessories field.

The consensus of opinion was that while some optimism may be justified in looking forward to the coming months in the accessories business, the practice should be to frown on the activities of those dealers who may permit an extremely sanguine view of increased public purchasing power to lead them on to unwarranted expansion.

Commissioner William M. Webster delivered the address of welcome at the annual dinner. E. S. Jordan, president of the Jordan Motor Car Company spoke on "The Automobile"; while Harry G. Moock, director of the Greater Market Development program, discussed "Merchandising Automotive Products"; George E. Quisenbury, New York, Business Publishers International Corporation described the "Growth of Automotive Industry Overseas," and C. M. Wynne, Chicago, president of Overseas Industries, Inc., gave some interesting experiences of "Co-operation in Export Selling Between Manufacturers and Importers."

Vickers Aircraft Expands

Construction of airplanes is proceeding at such a rate at the aircraft factory of Canadian Vickers, Ltd., at Montreal, Quebec, that it is proposed to extend the present plant by the erection of another building. It was only last autumn that a new shop was added and this is now being transformed into a two-story structure. Of 32 machines in course of construction or on order, twelve are part of the Royal Canadian Air Force special program of 26 machines. The feature of the machines under construction is a special type for aerial photographic survey work which has been so highly developed in Canada. It is a Vickers "Velos" with two "Wasp" engines of 435 hp. each equipped with electrical starters. It is designed for high-altitude photography and has enclosed cabin arranged for clear vision and all metal floats for landing on water. The other machines include eight Vickers "Vedette" three-seater, single-engine flying boats; two Vickers "Varuna" seven-passenger machines; one Vickers "Vista" and one "Vigil."

Johnson to Represent the Leipzig Fair in New York

H. A. Johnson has been appointed to represent the Leipzig Trade Fair in America, to succeed the late E. A. Boettcher. Mr. Johnson has had an extensive diplomatic and business experience in both the United States and Germany. He is a graduate of the Univeristy of Heidelberg, was for years connected with an American law firm in Berlin, and was later closely associated with the American Consul General in Germany. He was engaged for seven years as vice-president of a large textile concern in New York.

Edgar H. P. Meyer, of the London office, is at present visiting New York to develop closer international trade relationships between the three great industrial countries. The Leipzig Fair has been held without interruption for 700 years and last year attracted 1,500 American buyers. Mr. Johnson will make his headquarters at the office of the Leipzig Trade Fair, Inc., 630 Fifth Ave., New York.

Employee Conference

The fourth conference on employee representation under the auspices of the American Management Association will be held in the Benjamin Franklin Hotel, Philadelphia, on Dec. 1 and 2. There will be four general sessions covering a wide range of subjects, each introduced by an address by a prominent industrial leader. Among the speakers will be C. S. Redding, of the Leeds & Northrup Co.; E. K. Hall, the American Telephone and Telegraph Co.; T. H. A. Tiedemann, Standard Oil Co.; L. S. Bitner, Wm. Filene Sons Co.; W. F. Knoll, British Empire Steel Co.; W. F. Doherty, Bethlehem Steel Co.; C. S. Ching, United States Rubber Co.; and A. T. Kearney, Swift & Co. There will also be an exhibit of pamphlets, charts, books and other documents dealing with employee representation.

Conference on Machine Speeds

A general conference of executives and engineers of machinery manufacturing companies has been called by the American Engineering Standards Committee, the meeting to be held in the Engineering Societies Bldg., New York City, on Dec. 6. This conference will consider the standardization of initial machine speeds. A large attendance of machine tool builders is expected.

International Congress on Human Relations

The first triennial congress of the International Association for the Study and Improvement of Human Relations and Conditions in Industry will be held during the summer of 1928 at Girton College, Cambridge, England, from June 28 to July 3. The subject of the congress will be "The Fundamental Relationships Between All Sections of the Industrial Community." The congress will be open to members and to persons introduced by members.

The aim of the association is indicated by its title. Membership is open to all who are engaged in any undertaking involving the employment of persons, or who are occupied in work of scientific research or social significance bearing on industry, and who are in sympathy with the aims of the association. A meeting ground is offered within industry itself for the fulfilment of these aims by co-operation among directors, managers, engineers, foremen, general employees, personnel (welfare) workers, psychologists, factory doctors, factory inspectors, members of employers' and workers organizations, industrial research workers, educationalists and industrial social workers. At the present time the association draws its members from 26 countries.

Since its inception at Flushing, Holland, in 1925, the association has organized two meetings, the first in 1926 at the Rigi-Scheidegg, Switzerland; the second in 1927 at Baveno, Italy, which took the form of a summer school.

In choosing the subject for its first congress the association was guided by a desire to search for and define the natural elements composing each section, to promote within the industrial world a fuller knowledge of their relative value and to awaken a greater consciousness of their underlying unity.

The program of the congress containing all particulars will be published early in the new year. Persons desiring to receive a copy should communicate with the secretariat headquarters now situated at the Hague, Holland (Javastraat 66).

Taylor Society Meeting

A report on the manufacturers' marketing questionnaire, bringing this investigation up to date, will feature the annual meeting of the Taylor Society, which will be held in the Engineering Societies Bldg., New York, on Dec. 8, 9 and 10. This questionnaire is an inquiry into tendencies of marketing and is expected to reveal some interesting facts for further study by the society.

The preliminary program lists several sessions on the three days, concluding with a joint meeting with the management section of the American Society of Mechanical Engineers, which will be in session at the same time. Time study, economies in production, scientific management, and wages and prosperity are some of the general topics on which papers will be presented.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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AFTER each Election Day the mind of business America generally becomes introspective as it studies the significance of the votes cast. But as the electorate was not called upon to decide any important economic questions this year the only deductions to be drawn from the returns are those which relate to the presidential campaign of 1928. Upon them comment is unnecessary as they have been exhaustively discussed in the daily press.

It is, however, in order to point out that there was nothing in the "verdict of the ballots" to disturb either industry or finance and that the returns from some of the agricultural states suggest that the farmer is likely to receive more consideration in the future.

Washington advices also indicate that the flood problem will be given early attention now that it includes New England as well as the Mississippi Valley. This is important not only because it means much to the regions now menaced but also because it may involve the expenditure of an enormous sum and the employment of an army of men.

But this possibility has had no effect upon the present condition of business, which remains comparatively tranquil though somewhat less active than at this time last year. It might in fact be called depressed if 1926 had not been abnormal in both turnover and profits, thereby making it an unfair standard by which to measure the statistical record of its successor. Hence, too much consideration should not be given to the reported decline of 8 per cent in the car loadings for the week ending Oct. 29 or the reduction of 19½ per cent shown in the country's steel production for last month. As previously pointed out, these figures probably mark the nadir of the present commercial and industrial reaction and they warrant the expectation of a recovery rather than a further recession.

In the stock market the prevailing pessimism has been offset by the cheapness of money. Prices have been sustained although brokers' loans increased by $13,000,000 during the week, according to the Federal Reserve statement issued last Thursday. This statement also shows a loss of $22,000,000 in gold, which is probably accounted for by the shipments to Brazil. As a result the reserve ratio is down to 73.1, which is the lowest in some time and as the continued advance in the price of guilders had led some to predict that we shall soon be shipping gold to Holland it is quite possible that a sentimental tightening of the money market may be approaching. The words "sentimental tightening" are used advisedly, for any real shortage of credit still seems a long way in the future.

But as the stock market is always somewhat sentimental, shipments of gold already made and in prospect will probably prevent any important advance in prices, and the cautious men should carefully consider the wisdom of taking profits on stocks that are speculatively held.

Among the commodity markets cotton is the only one in which there has been any excitement. As usual it was caused by a government crop estimate which was a surprise because it indicated a yield that was about 350,000 bales above expectations. This is hardly more than the world's consumption for a week, but it disturbed the poise of the trade and carried prices down nearly 2 cents a pound.

In the sugar market a strange transformation seems to have taken place and many who are normally and perpetually bearish have become bulls upon the theory that Cuba's invitation to join in the control of prices will be accepted by the producers in Java, Czecho-Slovakia and France.

In Europe the most impressive event of the week was the decennial of the Bolshevist government, which was celebrated with great pomp in Moscow. The reported enthusiasm of the Russian people would seem to indicate that Communism is more permanent than Americans thought it could be.

According to Parker Gilbert, the financial situation in Germany is also unsatisfactory from an American viewpoint. But forewarned is forearmed, and unless the war debts and reparations cause another war they will probably be reduced or permanently amortized when their burden becomes unsupportable.

Meanwhile they are not causing much concern on this side of the Atlantic and we seem to be ready to loan money to Germany as willingly as to any of our late associates in the war. The October total of such loans was the largest for any month thus far and as our domestic loans were equally large an enormous sum has been put at the disposal of borrowers who must soon commence to spend liberally here or in Europe.

It was the expenditure of borrowed money during the war that made the non-combatants rich, and there seems no reason why a similar result should not follow the disbursement of the stupendous loans that are now being made in and by the United States. The analogy is so close that it appears to negative the idea that a prolonged depression in business is approaching.

WHAT'S DOING IN INDUSTRY

THE MODERATE activity that was reported in the machinery and machine tool industry last week continues. The first half of the month showed a fair volume of sales, with prospects for the closing of considerable pending business before the end of the month. Inquiries are largely for single tool requirements, but there are a few large lists of circulation which are thought to be for budget purposes. Sales are still behind those of the same period last year.

FLOOD conditions have naturally upset the business trend in parts of New England; machinery sales have slumped off in the Eastern section, but the Western territory has not been noticeably affected and demand continues for special machinery. Canada reports a decided improvement, with railroads, steel makers and building construction furnishing plenty of activity. The Southern district notes a slight increase in industrial activity, but sales volume is below expectations. The New York market continues along in a desultory way, orders being on a fair basis.

DETROIT is still the big question mark in the industry. There is a fair amount of activity, but watchful waiting is still affecting sales programs. Chicago reports fair demand from general industrial plants. Current business in Cincinnati is confined to single tools for replacements. The total volume of sales in Indianapolis is satisfactory as far as expectations are concerned.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

WESTERN NEW ENGLAND

Machine tool and machinery sales in the Western New England district for the past week were below expectations. The market, while not unfavorable to business, developed a new thread of uncertainty. Inquiries were lighter. Actual orders placed followed a similar trend.

A clock manufacturer in the Naugatuck Valley placed an order for a small list, composed for the most part of automatic presses. A screw machine products company and a large electrical manufacturer were in the market for automatic screw machines. Grinders continue to sell well to diversified producers. Other recent orders noted include a shaper, a number of small lathes and two vertical drills.

Inquiries are in circulation for woodworking machinery, including threaders, headers and pointers, with which to equip a wood screw plant to be established somewhere in Hartford County. Some manufacturers at Bridgeport are on full schedules. A Hartford special machinery plant is producing separate units for a glass bottle making concern. Flood conditions have somewhat hampered all industries. Transportation facilities have been disrupted and it will be several weeks before conditions begin to approach normal.

EASTERN NEW ENGLAND

Business in the machine tool industry during the past week shows an alarming slump, according to representative houses in Eastern New England. One firm ascribes this situation to the flood disaster in Vermont and western Massachusetts; another believes that appropriations for the year have been exhausted and orders are being confined to very small lots while marking time for the opening of 1928. Taken as a whole, the past week shows an unsatisfactory turnover for machine tools.

However, machine shop supplies have been in good demand, inquiries continuing brisk and volume, compared with last week, shows par figures.

CANADA

Conditions in the machinery and machine tool market in Canada are gradually improving. Railroad shops are buying new tools and will be in the market in the near future for still more. The Canadian Car and Foundry Co. received an order recently from the Algoma Central Railway for a number of freight cars. Automotive plants are speeding up and parts makers are reflecting the improvement. Dealers have been getting considerable tool business from the Ford Motor Co. of Canada, in connection with the changing over of the Border Cities shops for production of the new car. Inquiries for tools are out for the new axle department of the General Motors of Canada plant at Oshawa, Ontario.

Steel mills in all parts of the Dominion are working on heavy orders. Lately there has been a strong demand for steel for building purposes, structural shapes, reinforcing bars, builders' hardware, etc. It has been estimated that in Ontario and Quebec alone some 40,000 tons of structural business is now pending. Building contracts awarded in Canada during October totaled in value $47,135,400, being an increase of 8.6 per cent over October, 1926. It was the largest recorded total for any October.

Agricultural implement companies have been spending considerable money on enlargements to their plants and new equipment. Tool salesmen have been securing good business in electrical equipment plants, which are busy, owing partly to the activity in the mining and pulp and paper fields.

SOUTHERN DISTRICT

Slight improvement is reported in the last two weeks in the machinery and machine tool market in the South, though distributors state that business is not as active as they had expected it to be by this time.

Woodworking machinery continues to take the lead, and though fewer sales are being made than during October, business as a whole is still reported by most dealers the largest for this season in several years. Inquiries also are very active, and dealers look for this business to continue excellent the rest of November. Fairly good sales are reported in the textile field, both to new plants under construction and existing plants that are adding equipment or replacing some of their present equipment.

Construction is less active in the Southeast and there has been a decline in demand for contractors' machinery and equipment, though business is somewhat larger than normal. Sales of garage equipment continue to ease off from week to week as winter approaches, and only a few scattered sales are now being reported. Smaller shops are placing very few orders, and none hardly at all for new machinery or tools.

DETROIT

While the general atmosphere in the trade is fairly good it is nevertheless a fact that the machinery and machine tool market in the Detroit area is not all that could be desired. Last week and the week before there was a very good feeling based on the receipt of some fairly good orders. A great many inquiries were received too and it seemed that the month would be a prosperous one. There is still some evidence of that, but most of the dealers who were optimistic last week are now a little doubtful.

There is still everywhere apparent the apathy that has marked the automotive industry ever since the Ford Motor Co. first let it be known that a new car was being planned. All of the little flurries in the machinery and machine tool business have died because of the watchful waiting policy on the part of manufacturers.

This week about half of the small tool and die shops are busy. Some of them are very busy, but these are the ones that have had plenty of work throughout the entire period of depression. One of the larger shops is working night and day on a large die order for one of the automobile plants.

It is generally believed that there will be no great improvement in conditions here before the first of the year. The sales total for 1927 is considerably lower than the estimate made last January. Employment here has fallen off several thousand within the past ten days and there is no immediate prospect of an improvement. Contrary to many current rumors the Ford Motor Co. has not begun to hire men for the production of the new car.

NEW YORK

With November half over the volume of orders for machine tools in this territory is keeping up with earlier predictions. Some unexpected closings were reported in the past week, creating the impression that at least a part of the pending business will be closed up before the New Year.

Inquiries are not much in evidence, except for some lists which are known to have been sent out merely to get figures for budget purposes. One large order was reported placed with a local dealer—amounting to six figures. Some export business is also recorded from England, Belgium and Russia. South America continues a spasmodic buying program.

Standard machines are not in great demand. Special high-production units are finding buyers among industrialists and miscellaneous users of machine shop equipment. Boring mills, turret lathes, internal grinders, radial drills, tapping machines and die sinkers were among the types represented in last week's orders.

CINCINNATI

Machine tool manufacturers in the Cincinnati district report that sales in the past week were almost entirely confined to single tools and replacements. Some report a slight gain over the previous week but the majority report that their sales were practically the same. The principal buyers were machinists and general users, well scattered over the country, and the orders were well diversified in the matters of sizes and types.

A good volume of inquiries was received during the week. The general market, it is stated, is in about the same condition as it was at this time last year, when there was a large amount of business pending and when it seemed impossible to overcome the sales resistance in a reasonable amount of time. Rumors of price increases, it is thought, are at least in some cases lessening the delay in placing orders.

CHICAGO

Business in the machine tool industry is practically on the same level as for the last several weeks. Most dealers report little change in the situation, such orders as are received being of relatively small importance. Inquiries for single tools from railroad sources still continue, but no sales of moment are heard of. The demand for used tools is fair, but competition among dealers specializing in this line is so keen as to have resulted in considerable price cutting. Occasional sales to manufacturers of farm implements are reported, but for the most part general industry is responsible for the greater volume of present business. Inquiries are still being received in sufficient number to warrant an encouraging outlook.

Leaders in the machinery trade vary in their views with respect to how this year's

business will compare with that of last year, but all are practically agreed that the year 1927 will show a decline. An executive of one Chicago concern of prominence as a manufacturer of machine tools informed the writer that a tabulation of sales by his firm for the elapsed ten months of this year showed a loss of about 3 per cent as compared with the same period last year. This he regarded as not unfavorable in view of the general industrial conditions which have prevailed throughout the country.

INDIANAPOLIS

While the demand in this territory continues somewhat spotted, the general sales volume is about all that could be asked in view of other conditions. According to most members of the trade, the sales volume in dollars and cents will be on a par with the same season last year. The last few weeks have seen a considerable increase in demand for special textile machinery. Several replacements have been made, particularly in knitting machinery, and some entirely new installations have been made. The outlook this winter for business of this sort is bright.

An increase also is reported in demand from steel and other fabricating plants. Judging from reports from the Calumet steel district, this field should be a fertile one for some weeks, since several of the plants are increasing their production. Demand for coal mining machinery, after the first two weeks following the strike, has settled down to what likely will be a steady volume during the winter. Machinery for mine machine shops seems to be particularly needed. Demand is very slow from the automobile industry and buying is entirely on an emergency basis, with the plants producing but little.

Construction Council at St. Louis

The sixth annual convention of the American Construction Council, will be held at the Hotel Statler, St. Louis, Dec. 1 to 3. The discussions will center along the general theme of "Assaying the Construction Industry—Its Needs and What Should Be Done About Them."

With the transition from the hectic building conditions of the past few years into the coming period of more modulated construction, it is felt that the most important service the council can render the construction industry and the public at this time is to make a searching assay of tendencies and underlying relations throughout the entire construction industry and give careful consideration to what these may augur for the future.

The convention will take on the atmosphere of round table discussions with speakers of national prominence addressing the gatherings. Franklin D. Roosevelt, president of the council, will conduct the various sessions.

Vocational Association Second Meeting

A new organization, known as the American Vocational Association, will meet in Los Angeles, Dec. 17, 19 and 20, for its second annual convention. This organization is an amalgamation of the Vocational Education Association of the Middle-West, and the National Society for Vocational Education. Its membership consists of those interested in modern education wherein the need for a training for life employment has been recognized. It represents all of those interested in trade and industrial education, home economics education, manual arts education, foreman training, retail store training, agricultural education, vocational rehabilitation, and vocational guidance.

Speakers will represent the departments of education of both Canada and Mexico. Educational experts and industrial representatives will discuss problems of common interests in the field of education as applied to the needs of the worker.

Decline in Machinery Imports to Italy

Industrial dullness in Italy, in evidence by the latter half of 1926 and in the early months of 1927, continued throughout the first half of the year, with a corresponding decline in machinery imports during this period, according to the Department of Commerce. This falling tendency was especially marked in imports of machine tools and textile machinery which are among the most important classes of industrial machinery which Italy obtains abroad.

During the six months of 1927, imports of machine tools totaled 2,356 metric tons, or considerably less than half the imports under that head during the corresponding period of 1926. Imports of spinning machinery likewise fell from 8,927 to 2,789 metric tons and shipments of weaving machinery from 53,372 to 19,865 quintals during the same period.

Imports of industrial machinery from the United States suffered particularly severe declines during the first half of 1927, amounting to only 191 metric tons as compared with 594 metric tons for the corresponding period of 1926. Imports of spinning machinery from the United States declined from 1,202 to 40 metric tons and of weaving machinery from 18 to 3 metric tons during the same period.

Oakite Sales Conference

The eleventh annual sales conference of Oakite Products, Inc., formerly the Oakley Chemical Company, was held in the general offices of the company at 22 Thames St., New York, Nov. 7, 8 and 9. This was followed by a district managers' conference on Nov. 10. One of the interesting features of these conferences and which makes them not only unusual, but enables a large amount of business to be transacted, is the scheduling of each paper and the adherence to this schedule.

The various papers brought out a large amount of useful information as to approved cleaning methods, as well as rust prevention. Other uses of their material were also brought out at the conference.

Leeds Announces Resignation

Edward L. Leeds has resigned as vice-president and director of the Niles-Bement-Pond Co., of New York, and vice-president of the Pratt & Whitney Co., of Hartford, Conn. in order to devote his time to his personal interests.

Mr. Leeds has been identified with the machinery industry for a number of years. He began his engineering career with the Yale & Towne Manufacturing Co., of Stamford, Conn., and later became associated with the Brown Hoisting Machinery Co. of Cleveland, where he held the position of assistant general manager, and later European manager with headquarters in London, England.

He has been associated with the Niles-Bement-Pond and Pratt & Whitney companies since 1906 as manager of the railway department, general sales manager and vice-president.

Mr. Leeds contemplates taking a short vacation after which he will announce his business plans for the future.

Europe Is Recovering from War Burden

Europe has made definite progress toward economic recovery during the last few months, says Basil Miles, American administrator at the headquarters of the International Chamber of Commerce, in a report recently made public by the American section of the chamber. While many difficulties yet remain, he says, they are being recognized and overcome from day to day.

Individual countries, Mr. Miles reports, are progressing steadily to an extent which has already changed the face of Europe and, by that very fact, have bettered conditions elsewhere beyond its confines. Those who have observed France are clear in their minds that the capable performance of M. Poincaré's administration is reaping its logical harvest. Prices are still out of harmony, but confidence and stability have wrought their inevitable benefits. The pressure of political considerations alone, in the form of the general elections impending next spring, retard the placing of the capping stone on the financial recovery of the country in the shape of a definite stabilization of the currency.

Critics who are skeptical about Germany seem to ignore the incontrovertible facts of the rise from chaos to stability in three years. Critics of Italy seem impressed rather by the price paid than by the amazing benefits—not only material but spiritual—which Italians have received in return for the sacrifices their present régime has required.

"The situation today is so much brighter than two years ago that many have forgotten the possibility of comparison. Perhaps the darkest cloud in Europe is that which hovers over the delayed solution of the relations between capital and labor," concludes Mr. Miles.

Personals

R. P. NICK has been transferred from the Baltimore to the Lancaster, Pa., office of the Lincoln Electric Co., of Cleveland.

A. C. HIGGINS, treasurer of the Norton Co., Worcester, Mass., has been elected a director of the Boston & Albany Railroad Co., to succeed William J. Hobbs.

A. E. GIBSON has been elected president and treasurer of the Fulton Foundry and Machine Co., of Cleveland. He succeeds Carl F. Mead, who has retired.

RAYMOND S. HOFFMAN has been appointed mechanical superintendent of the Bayway Refinery of the Standard Oil Co., of New Jersey.

WILLIAM A. WASKEY, general manager of the Malleable Iron Works, of New Britain, Conn., has resigned to become associated with the International Harvester Co., at Hamilton, Ontario.

E. R. FEICHT has been appointed chief engineer of the Collins & Aikman Corporation, of Philadelphia. He was formerly plant engineer for the Bridgeport Brass Co., Bridgeport, Conn.

RICHARD DEVENS, for twenty years New York manager for the Brown Hoisting Machinery Co. of Cleveland, has joined the Link-Belt Co., of Chicago Ill. as sales engineer for the sale of crane products in the Eastern territory. His headquarters will be at the New York office 233 Broadway.

GEORGE W. RANGER, works manager for the Fairmont Mining Co., Fairmont, West Va., has resigned to become general manager of the Pulaski Foundry and Manufacturing Corporation, and the Pulaski Engineering Works, Inc., both of Pulaski, Va. These companies manufacture cast-iron and steel machinery, and heavy plate and structural steel.

Business Items

The Verner Steel Products Co., of Chicago, has been appointed factory representative in that territory for the Adriance Machine Works, of Brooklyn, N. Y.

The Cooper Hewitt Electric Company announces the removal of its general offices to its new building at 410 Eighth St., Hoboken, N. J.

The Manufacturers' Gear and Machine Co., of Cincinnati, has taken over the patterns, jigs and fixtures of the Queen City Machine Tool Co., and hereafter will furnish repairs for all Queen City shapers.

The Ferguson Gear Co., of Gastonia, N. C., has opened a branch office at 77 Cortlandt St., in New York. New England, New York, New Jersey, Pennsylvania, Delaware and Maryland will be covered from this office.

The Parker-Kalon Corporation, of New York, manufacturer of hardware and sheet metal specialties, announces the removal of its factory and general offices to a new building at 200 Varick St. The entire sixth floor will be occupied.

The Manchester Tool Co., Manchester, Conn., manufacturer of reamers and special tools, has taken quarters formerly occupied by the Gammons-Holman Co. on Adams St. Conrad H. Beaupre is general manager, and Charles W. Hollister is office manager.

The Farmers Salvage Co. is establishing a plant, including machine shops, at Bennettsville, S. C., for the rebuilding of farm machinery and implements. The company also plans establishing similar plants in several other Southeastern states.

The Southern Ry. has announced plans for the erection of additional facilities at Macon, Ga., to include a roundhouse and shops, installation of a modern coaling system and increased water facilities, total cost of the project, including machinery, equipment, buildings, etc., to be between $350,000 and $400,000.

The Chromium Process Co., of Derby, Conn., which is engaged in the process of electro-deposition of all metals subject to the chromium process, has acquired the plant of the Maxim Munitions Co., owned by the Sponge Rubber Products Corporation, and will start operations immediately under the management of Norman Tice, of New Haven.

The Gerrard Co., Inc., has been organized and incorporated to take over the interests of the Ti-It Machines Co., and the Gerrard Wire Tying Machines Co. A. J. Gerrard is president of the new organization. E. A. W. Murray, formerly president of the Ti-It company, is vice-president and Western manager of the new concern. T. J. King is vice-president and Eastern manager.

Two executives of the Wayne Co., pump and tank manufacturers of Fort Wayne, Ind., have been named vice-presidents of the company by the board of directors. They are William F. Brandt, general superintendent of the factory, and A. D. Cariger, sales manager of the tank and pump division. Mr. Brandt has been with the company sixteen years, starting as a machinist. Mr. Cariger joined the company three years ago.

The Kearney & Trecker Corporation, of Milwaukee, manufacturer of milling machines, has opened a branch office and showroom in Detroit, at 5924 Second Blvd. R. W. Burk has been appointed manager of this office. George E. Gustafson and William Mirgeler will be assistants. Mr. Burk was formerly district manager for the Landis Tool Co., in Chicago. Mr. Gustafson has been sales engineer for the company, and Mr. Mirgeler has been factory representative working directly from Milwaukee.

The machinery of the Lampman Tool Co., of Angola, and the armature winding business of John O. Havens, of Indianapolis, which has been combined to form the Lampman Manufacturing Co., Inc., Huntington, Ind., will be installed in the new plant in Huntington in about two weeks. Directors of the new company include Herman Martin, George J. Bippus, and Walter H. Ball. Mr. Lampman will be in charge of production and Mr. Havens will be manager and head of the sales force.

Walter B. Lasher, president of the American Chain Co., of Bridgeport, Conn., is supervising the financing for the expansion of the Magazine Repeating Razor Co., 285 Madison Ave., New York, makers of the Schick safety razor and blades. A recent letter to stockholders outlines these plans for a capital increase to be used to speed up production and increase distribution. The company is interested in securing a new steel to manufacture razor blades that will be the sole property of the organization. Research will be conducted with this end in view. The new capital will be used primarily for a superior steel, research laboratory and added manufacturing facilities, including machine equipment.

Obituaries

VINCENT J. HUGHES, president of the Canada Iron Foundries, Ltd., died in Montreal on Nov. 10.

GEORGE HILLARD BENJAMIN, industrial engineer and patent expert, died at his home in New York City on Nov. 10. He was 75 years old.

JAMES POWERS, inventor of the tabulating machine that bears his name, died at his home in New York City on Nov. 8. He was 57 years old.

ALBERT CHAMPION, president of the AC Spark Plug Co., of Flint, Mich., died in Paris on Oct. 27. Mr. Champion was well known in automotive circles both here and abroad.

ALBERT H. ACKERMAN, metallurgical engineer, well known expert in the steel industry, died at his home in Chicago on Nov. 3. Mr. Ackerman gained prominence as the first engineer to supervise the making of cold rolled steel, including the putting of coloring into the metal.

JOHN M. JONES, president of the Eastern Rolling Mill Company and the Baltimore Tube Company, both of Baltimore, and well known in the steel industry in which he had been engaged all his life, died on Nov. 1 at his home in Baltimore. He was 57 years old. He had been ill only a few days.

Calendar of Local Meetings

American Society of Mechanical Engineers

Cleveland Section. Nov. 19. All-day session at Youngstown, Ohio. Subject: "Inauguration of the New Professional Division of the Iron and Steel Industry."

Metropolitan Section. Nov. 22. Engineering Societies Bldg., evening. Subject: "The Oil Engine and Aeronautics," by Commander E. E. Wilson.

Philadelphia Section. Nov. 22. Engineers' Club of Philadelphia, evening. Subject: "Maintenance of Machine Tools," by J. C. Mattern.

Rock River Valley Section. Nov. 18. Nelson Hotel, evening. Subject: "Management," by Dr. Julius Klein.

Society of Automotive Engineers

Detroit. Nov. 21. Subject: "Production Progress and Tire Simplification," by B. J. Lemon.

National Association of Cost Accountants

Buffalo Chapter. Nov. 17. Hotel Lafayette. Subject: "Operating and Financial Ratios."

Cleveland Chapter. Nov. 16. Plant Visitation, American Multigraph Co.

Utica Chapter. Nov. 21. Subject: "Traffic Problems," by F. B. Ruder, Remington Typewriter Co.

Erie Chapter. Nov. 21. Subject: "Standard Costs as Applied to Jobbing Plants."

Hawaii Chapter. Nov. 28. Subject: "Sugar Plantation Accounting—Practical Methods vs. Theory," by Arthur Grounds.

Kansas City Chapter. Nov. 28. Subject: "Various Phases in Factory Insurance."

Los Angeles Chapter. Nov. 22. Subject: "Use of Costs by Club Managers," by Karl Lott.

Philadelphia Chapter. Nov. 18. Subject: "Pennsylvania State Taxes," by Hon. Franklin Spencer Edmonds.

Forthcoming Meetings

A regional conference of the power and farm machinery division of the American Society of Agricultural Engineers will be held at the Hotel Sherman, Chicago, Nov. 28 and 29. The organization is headed by O. B. Zimmerman of the International Harvester Co.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., New York City, Dec. 5 to 8. C. E. Davies, assistant secretary in charge of meetings, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Sixth annual event in the Grand Central Palace, New York, Dec. 5 to 10. Charles F. Roth, manager, Grand Central Palace, New York City.

Power Transmission Association. Annual meeting, Dec. 7, Hotel Commodore, New York City. W. S. Hays, secretary, Drexel Bldg., Philadelphia.

American Association for the Advancement of Science. Second Nashville meeting, Nashville, Tenn., Dec. 26-31, general headquarters Andrew Jackson Hotel. General chairman, W. S. Leathers, M.D., professor of preventative medicine and public health, Vanderbilt Medical School, Nashville, Tennessee.

The Weekly Price Guide

Rise and Fall of the Market

MOST of the price changes of the last week were in a downward direction and affected mainly the non-ferrous metal products. Pig-iron continues to decline as reserves accumulate. Galvanized steel sheets are off 10c. per 100 lb. at Pittsburgh mill. Tin reached a new low for the year (Nov. 10) while lead, zinc, solder, highest grade babbitt metal, and scrap brass and zinc ruled at prices below those of the preceding week. Copper showed advancing tendencies as did lead and copper scrap, during the last week. Linseed oil is up 2½c. at New York and 3c. in Chicago. The principal hot-rolled steel products hold at $1.75 per 100 lb., f.o.b. Pittsburgh. Increasing demand, some of it unseasonal, is noted in c.-i. pipe, strip steel, rails, sheets, large size lap-weld pipe, railway and automotive material.

(All prices as of Nov. 11)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	17.25
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	4.30
New York	4.75@5.25
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.15	3.50	3.25	3.89
No. 12	2.15@2.20	3.55	3.30	3.94
No. 14	2.20@2.25	3.60	3.35	3.99
No. 16	2.30@2.35	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.70	3.75	3.55	4.00
No. 22	2.85	3.90	3.70	4.15
No. 24	2.90	3.95	3.75	4.20
No. 26	3.00	4.05	3.85	4.30
No. 28	3.25	4.20	4.00	4.45
Galvanized				
No. 10	2.95@3.05	4.10	3.80	4.25
Nos. 12 to 14	3.05@3.15	4.20	3.90	4.35
No. 16	3.15@3.25	4.30	4.00	4.45
No. 18	3.30@3.40	4.45	4.15	4.60
No. 20	3.45@3.55	4.60	4.35	4.75
No. 22	3.50@3.60	4.65	4.40	4.80
No. 24	3.65@3.75	4.80	4.50	4.95
No. 26	3.90@4.00	5.05	4.75	5.20
No. 28	4.15@4.25	5.30	5.00	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

— Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches ¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	5.70	6.10
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	4.00	3.65	3.60
Cold drawn, flats and squares	4.50	4.15	4.10
Structural shapes	3.34	3.00	3.10
Soft steel bars	3.24	3.00	3.00
Soft steel bar shapes	3.24	3.00	3.00
Soft steel bands	3.99	3.65	3.65
Tank plates	3.34	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅛, 8.35c.; ¼, 7.85c.; ⅜ to ½, 7.35c. per lb. *Flat, ⅛@½-in. thick. †Shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York	14.75		
Tin, pigs, 5-ton lots, New York	58.00		
Lead, pigs, up to carlots, E. St. Louis	6.00	New York	6.87½
Zinc, slabs, up to carlots, E. St. Louis	5.60	New York	6.50

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	14.00	14.00	13.00
Copper sheets, base	22.00	22.00	22.00
Copper wire, base	18.75	18.75	15.25*
Copper bars, base	21.50	21.50	21.50
Copper tubing, base	24.00	24.00	24.00
Brass sheets, high, base	18.25	18.25	18.25
Brass tubing, high, base	23.12½	23.12½	23.12½
Brass rods, high, base	16.00	16.00	16.00
Brass wire, high, base	18.75	18.75	18.75

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	24.37½@25	26@27	26.02
Zinc sheets (casks)	11.00	11.55	10.11
Solder (½ and ½), (case lots)	35.75	37.00	34@38

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	75.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	12.50

Nickel, f.o.b. refinery, cents per lb.:

Ingots..... 35.00 Electrolytic . 37.00 Shot.....36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	11.50 @11.75	10.75	10.00@10.50
Copper, heavy, and wire	11 12½@11.62½	10.75	9.75@10.25
Copper, light, and bottoms	9 87½@10.12½	9.25	8.75@ 9.25
Heavy lead	5.00 @ 5.50	5.25	4.50@ 5.00
Tea lead	4.00 @ 4.25	3.75	3.50@ 4.00
Brass, heavy, yellow	7.00 @ 7.50	7.00	6.75@ 7.25
Brass, heavy, red	9.00 @ 9.25	9.50	8.75@ 9.25
Brass, light	5.25 @ 5.75	5.50	5.75@ 6.25
No. 1 yellow rod turnings	7.25 @ 7.75	7.00	6.75@ 7.25
Zinc	3.50 @ 3.75	3.25	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade				
IC,	14x20	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20	6.45	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating—Per box			
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@ 17
Wiping cloths, washed white, per lb	.15½	36 00 per M	.15
Sal soda, per lb	.03¾	.02	.02¾
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.79½	.94	.80
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.27	.35	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	35%	35%	35%
Heavy grade	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%*
Second grade	50–10%	60–5%	50–10%†

*Large quantities, 60%. †Large quanities, 60-10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.16	.16	.1662½
Solder (½ and ½)	per lb.	.35¾	.37	.42½
Cotton waste, white	per lb.	.10@13½	10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	.27	.27	.35
Belting, leather, medium	off list	35%	35%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville, 2.75@3.00	
Coke, prompt foundry, per net ton		Connellsville, 3.75@4.50	
White lead, dry or in oil	100 lb. kegs	New York,	13.75
Red lead, dry	100 lb. kegs	New York,	13.75
Red lead, in oil	100 lb. kegs	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger up to 1 x 30-in.	50%
1¼ and 1½ in. dia.	35%
Carriage bolts:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb.	$3.50*
Rivets, button and cone head:	
Small, including 7/16-in. dia.	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.

*$1.50 off list for broken keg lots. †$6.50 broken keg lots, net.

Machine Requirements and Industrial Construction

Equipment Wanted

Conn., Hartford — Owner, c/o Watson Hartley, Hotel Touraine, Boston, Mass.—headers, threaders, pointers and other machinery for proposed wood screw manufacturing plant, here.

Ill., Chicago—Dept. of Public Works, City Hall—one 10 ton hand operated traveling crane with all accessories at Chicago Ave. pumping station, 811 North Michigan Ave.

Mass., Boston—Premier Bedding Co., 57 Bristol St.—trip hammer.

Mass., Boston—Richardson Wright & Co., 65 Beverly St.—power punch press, medium size.

Mass., Fitchburg—Kenmore Realty Co., 41 Nobscot Rd., Newton.—miscellaneous tool and equipment for proposed 2 story repair and service garage here. Estimated cost $50,000.

Mass., Malden (Boston P. O.)—Malden Investment Co., 112 Pleasant St.—miscellaneous tools and equipment for proposed 1 story repair and service garage. Estimated cost $40,000.

Mass., Waltham (Boston P. O.)—E. E. Smart, 809 Main St.—miscellaneous tools and equipment for proposed 1 story repair and service garage. Estimated cost $40,000.

Mich., Detroit—Frederick Colman & Sons, 7250 Central Ave.—radial drill.

N. J., Lambertville—Fire-Ball Mfg. Co., G. Smith, Secy. and Treas.—prices and catalogs on stamping machine and dies.

O., Hamilton — Butler County Motor Sales Co., Second and Marshal Sts., W. A. Harshaw, Pres. and Mgr.—equipment including drill press, etc. for recently acquired service station.

O., Youngstown—Youngstown Sheet & Tube Co.—special thread milling machine.

Pa., Meadville—Erie Railroad Co., 71 West 23rd St., New York, N. Y., W. R. Collins, Purch. Agt.—one 20 ton crane for proposed new shop here.

Pa., Sharon—Sharon Steel Hoop Co., A. Trosk, Purch. Agt.—two 10 ton one 7½ and one 35 ton cranes.

Tex., Corpus Christi—Alamo Iron Works, 130 Santa Clara St., San Antonio—electric crane for proposed 2 story warehouse, here.

Opportunities for Future Business

Conn., Bristol—New Departure Mfg. Co., 269 North Main St., awarded contract for a 2 story, 52 x 90 ft. factory on Race St. Estimated cost $40,000.

Conn., South Norwalk — The Nash Engineering Co., has acquired a site and plans the construction of a plant for the manufacture of machinery used in the paper industry. Estimated cost $40,000. Architect not selected.

Fla., Jacksonville — Standard Motor Equipment Corp., C. B. Lozier, Barnett Bank Bldg., Pres., has acquired a site and plans the construction of first unit of plant for the manufacture of cooled spark plugs, including machine shops, etc.

Ill., Chicago—Advance Pattern & Foundry Co., 2734 West 36th Pl., had plans prepared for a 1 and 2 story, 125 x 365 ft. foundry at 36th Pl. and California Ave. Estimated cost $125,000. A. A. Wickland & Co., 5 South Wabash Ave., Engrs. Noted Oct. 20.

Ill., Chicago—H. Ericsson, 228 North La Salle St., plans the construction of a 2 story, 127 x 150 ft. repair and storage plant at 2022 Kolmar Ave. N. Estimated cost $200,000.

Ill., Chicago — S. Refas, 6 North Clark St., awarded contract for a 2 story, 90 x 150 ft. garage at 7528 Hilldale Ave. Estimated cost $125,000.

Ill., Chicago—Russavok Can Co., Carpenter St. and Ogden Ave., manufactures of sheet metal products, awarded contract for a 1 story, 194 x 323 ft. factory. Estimated cost $110,000. Noted Oct. 6.

Ill., Chicago—Sherman Klove Co., 4640 West Harrison St., awarded contract for a 1 story machine shop at 3531 West 47th St. Noted Oct. 20.

Ind., Fort Wayne—General Electric Co., 1635 Broadway, awarded contract for a 1 story, 90 x 120 ft. addition to factory on Winter Ave. Estimated cost $60,000.

Ind., Fort Wayne—W. K. Noble, awarded contract for a factory. Estimated cost $42,000. Fisher Electrical Co., 1740 Lafayette St., lessee.

Ind., Fort Wayne—G. L. Ohmart Co., 220 Cooper Bldg., awarded contract for a 1 story, 35 x 150 ft. machine shop and service building at 340 East Berry St. Estimated cost $43,000.

Ind., Fort Wayne — Truck Engineering Co., R. Spaulding, East Pontiac St., is having plans prepared for a 1 story, 60 x 100 ft. factory. Estimated cost $40,000. G. Mahurin, 425 Standard Bldg., Archt.

Ia., Dubuque — Maiswood Products Co. awarded contract for a 3 story, 60 x 450 ft. wallboard factory. Estimated cost $80,000. Noted June 30.

Ia., Marshalltown—Fisher Governor Co., manufacturers of pump governors, etc., is having plans prepared for a 1 story, 76 x 120 ft. addition to factory. H. E. Reimer, Archt.

Md., Baltimore—Baltimore Copper Smelting & Rolling Co., Canton St., plans the construction of a 1 story, 108 x 396 ft. plant at 5th Ave. and 8th St., also a 1 story 42 x 140 ft. warehouse at Clinton Ave. and 4th St. Estimated cost total cost $165,000.

Md., Baltimore — Levenson & Zenitz, Howard and Ostend Sts., manufacturers of upholstered furniture, plans a 2 story addition to plant.

Md., Baltimore—Union Bros., 41 West Cross St., manufacturers of upholstered furniture, plans a 3 story addition to factory.

Mass., Arlington (Boston P. O.)—H. L. Frost Co., 20 Mill St., awarded contract for a 2 story, 60 x 70 ft. garage and repair shop on Mill St. Estimated cost $40,000. Noted Nov. 3.

Mass., Attleboro—L. G. Balfour & Co., 25 County St., manufacturing jewelers, is having sketches made for a 2 story addition to factory. F. B. Perry, 44 Franklin St., Providence, R. I., Archt. and Engr.

Mass., Chestnut Hill (Boston P. O.)—Osborne Howes, Esq., Hammond St. and Pine Rd., awarded contract for the construction of a veneer house.

Mass., Newburyport—Henchey Motor Co. awarded contract for a 1 story, 75 x 90 ft. repair shop and service station on Bridge Rd. Estimated cost $45,000.

Mass., North Woburn (mail Woburn)—Hopkinson Japaning Co., c/o M. Kaplin, 123 Gardner Rd., Brookline, Controlling Stockholder, plans to rebuild plant recently destroyed by fire. Estimated cost $100,000. Architect not selected.

Mass., Somerville (Boston P. O.)—F. G. Volpe, Hager St., Arlington, awarded contract for a 1 story, 50 x 100 ft. machine shop and foundry at 14 Kent St. here.

Mass., West Roxbury (Boston P. O.)—L. W. Moody, 29 Gould St., awarded contract for a 1 story, 50 x 70 ft. machine shop on Willow St.

Mass., Worcester—M. J. Whittall Associates, awarded contract for a 2 story, 60 x 220 ft. machine shop, winding and finishing building, etc.

Mich., Detroit—Detroit Garages Inc., 510 Cass Ave., is having plans prepared for a 10 story, 90 x 110 and 50 x 130 ft. garage. Estimated cost $400,000. Architect not announced.

Mich., Detroit — A. Kahn, 1000 Marquette Bldg., Archt., will receive bids until Dec. 1, for a 10 and 25 story garage and office on West Grand Blvd. for New Center Development Co., General Motors Bldg.

Mo., St. Louis — Buck's Stove & Range Co., 3500 North Second St., awarded contract for a 2 story factory on North Second St. Estimated cost $45,000.

Mo., St. Louis—N. O. Nelson Mfg. Co., Tenth and Chestnut Sts., manufacturers of plumbers' supplies, is having preliminary plans prepared for the construction of a factory on Boyle St. Estimated cost $300,000.

Neb., McCook—Morton Bros., Lexington, Neb., plans the construction of an airplane factory, here. Estimated cost $50,000. Architect not selected.

Neb., Omaha — Allen & Wallace, 224 Brandies Theatre Bldg., Archts., are receiving bids for a 3 story, 36 x 96 ft. sales and service station at 19th and Howard Sts. for Nebraska Buick Auto Co., 502 South 19th St. Estimated cost $100,000. Noted Sept. 29.

Neb., Ralston — Krittenbrink & Sons Brick Co., 13th and Frederick Sts., Omaha, will build a brick plant including 28 x 151 ft. machine shop, 40 x 50 ft. garage, etc., here. Estimated cost $150,000. J. P. Guth, 516 Paxton Bldg., Omaha, Archt.

N. J., Asbury Park — S. Schneider, 418 Main St., is having plans prepared for a 3 story, 100 x 150 ft. machine shop and garage, etc .at Cookman and Munroe Aves. Estimated cost $400,000. C. B. Cook, 700 Sixth Ave., Archt.

N. J., West New York—Owner, c/o F. J. Ricker, 685 Hudson Ave., Archt., is having plans prepared for a 2 story, 25 x 80 ft. machine shop at 13th Jackson Sts. Estimated cost $40,000.

N. Y., New York—Dept. of Water Supply, Gas & Electricity, N. J. Hayes, Comr., Municipal Bldg., will receive bids until Nov. 18 for the construction of a repair company building at 28 Vandewater St.

O., Canton—Everhard Mfg. Co., 1592 7th St. S. W., manufacturers of rubber workers' tools, flyscreens and metal specialties, plans the construction of a 1 story, 72 x 102 ft. factory. Estimated cost $40,000.

O., Columbus — Colonel Aeire, No. 287 Eagles, 771 Ninth High St., R. J. Bartlett, Chn. Building Committee, is having sketches made for a 4 story, 90 x 180 ft. garage. Estimated cost $300,000. Architect not selected.

O., New Lexington—J. A. McCune & Sons, awarded contract for 2 story, 35 x 85 ft. addition to repair and service garage. Estimated cost $30,000.

Pa., McKeesport—Columbia Radiator Co. is receiving bids for a 1 story, 80 x 200 ft. addition to factory. Estimated cost $50,000. Private plans.

Pa., Philadelphia—York Ice Machinery Co., c/o E. H. Poggi, Equitable Bldg., Archt., will soon award contract for a 2 story, 107 x 125 and 25 x 75 ft. factory at 1238 Belmont Ave.

Tenn., Nashville—Davidson Co. Highway Comn., F. M. Dorris, Chn., will receive bids until Nov. 28, for the construction of a machine shop and garage at 5th and Hitt Sts. Estimated cost $125,000.

Ont., Toronto—Toronto Motor Car Co., 120 Adelaide St. W., is having plans prepared for a 2 story, 140 x 145 ft. garage at Yonge and Orchard View Blvd. Estimated cost $150,000. Hutton & Sauter, 6 James St. S., Hamilton, Archt. Noted Oct. 20.